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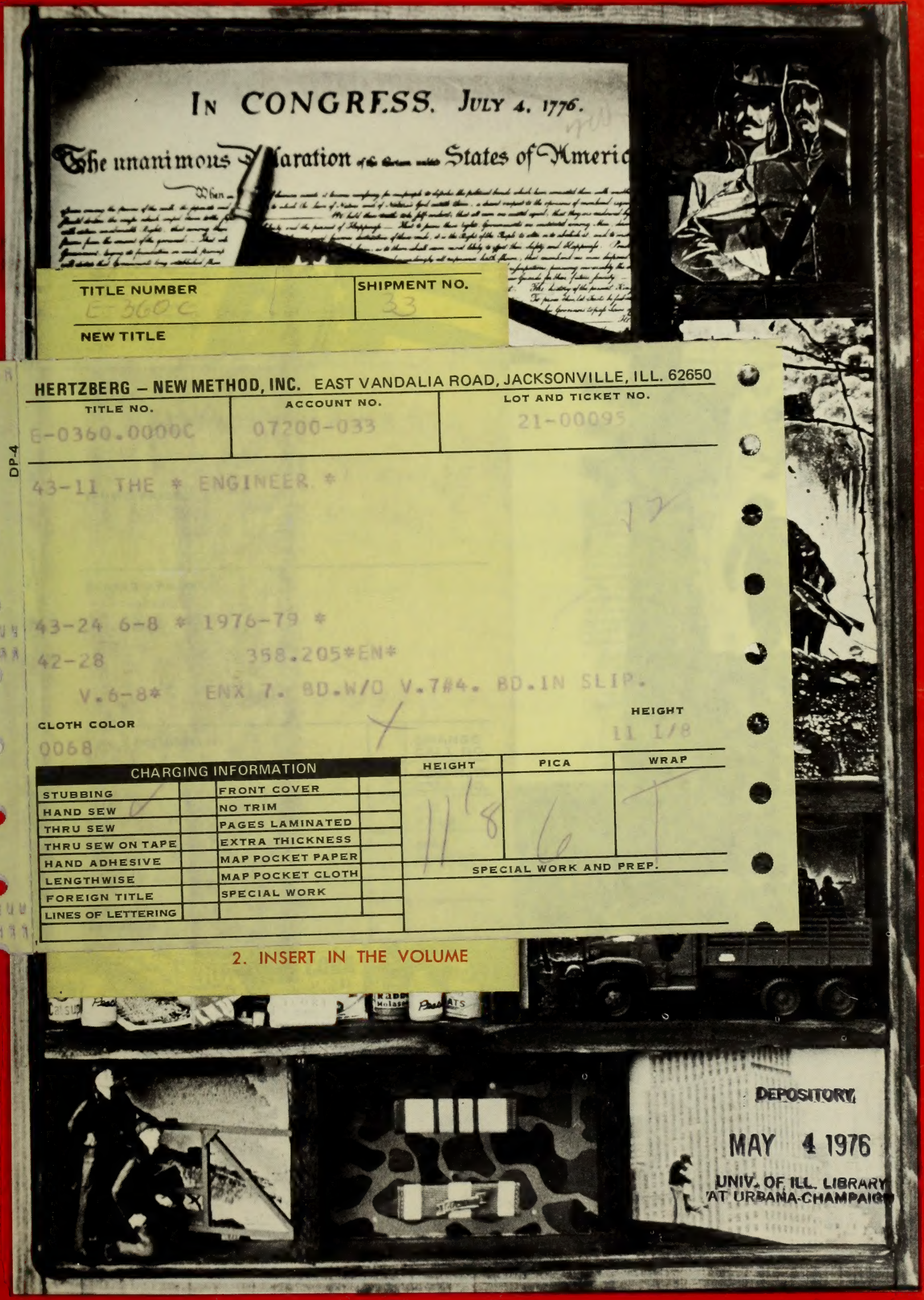
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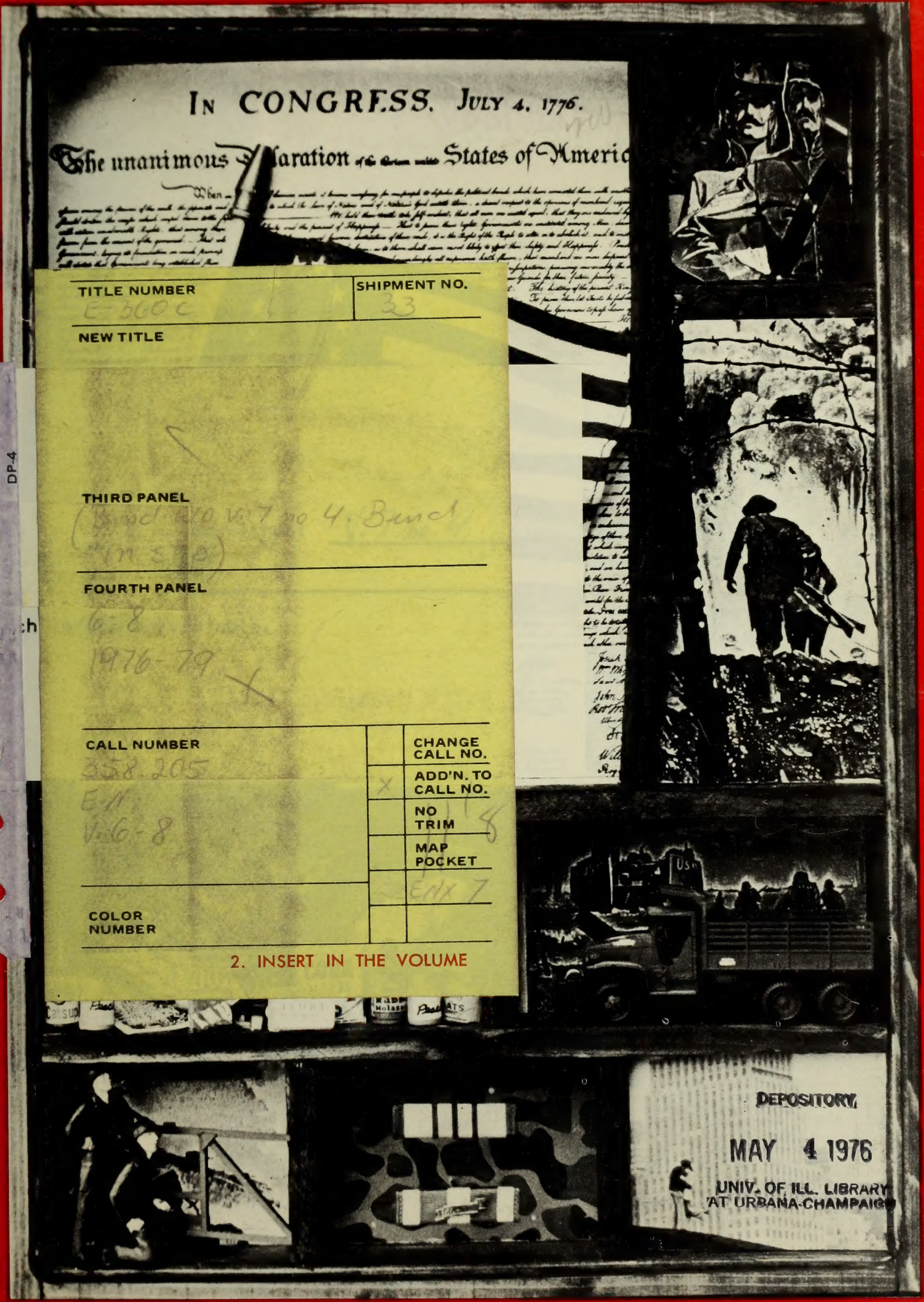
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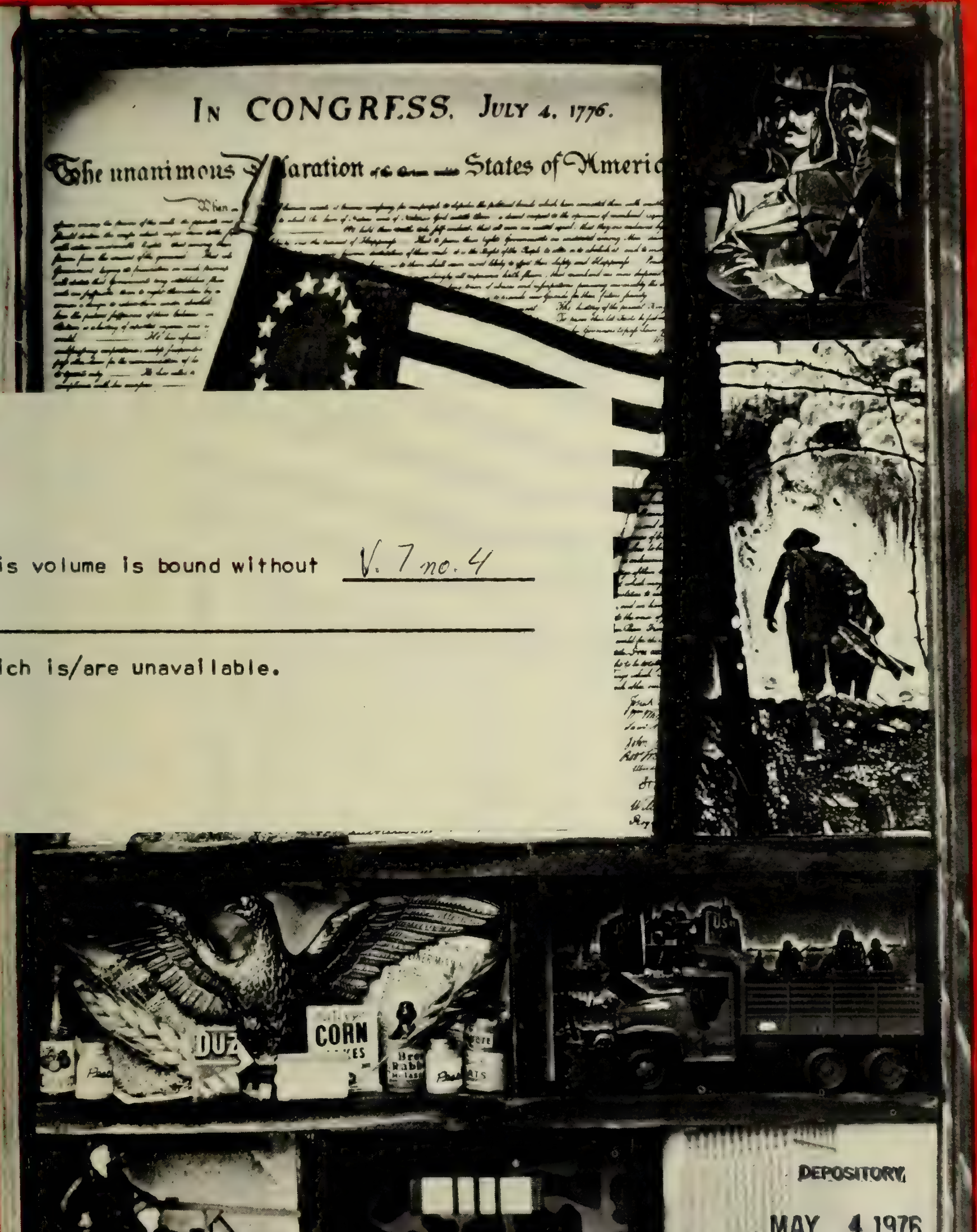
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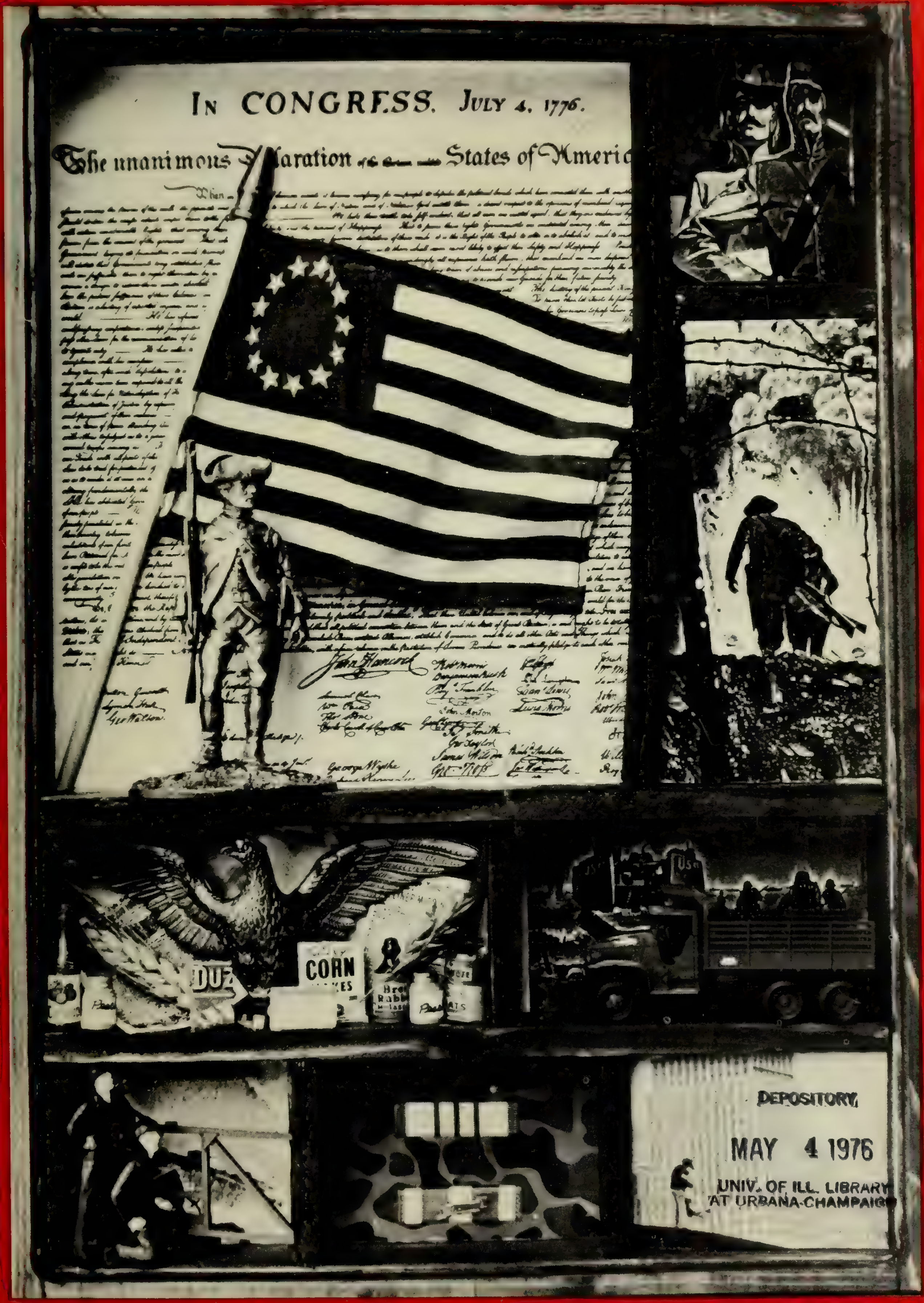
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THE ENGINEER

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CHIEF'S BRIEFS

Brevet Major General Horatio Gonverneur Wright was born in Clinton, Connecticut, March 6, 1820. He was graduated from the United States Military Academy July 1, 1841 and promoted Second Lieutenant, Corps of Engineers.

Wright was superintending engineer of the building of Fort Jefferson, Tortugas, Florida, 1846-1856. While Assistant to the Chief of Engineers, 1856-1861, he was a member of a board to study iron carriages for seacoast guns, and the adaptability of 15 inch guns for ordnance. He was co-author of "Report on Fabrication of Iron for Defenses."

From Chief of Engineers of a division at the first Battle of Bull Run, he advanced to command the famous 6th Army Corps which saved Washington D.C. from capture in 1864, and later spearheaded the final assault on Petersburg and the pursuit of Lee to Appomattox in 1865.

Wright commanded the Department of Texas, 1865-1866, and served as Assistant Chief of Engineers and member of many engineering boards until he was appointed Chief of Engineers in 1879. General Wright retired March 6, 1884, and died July 2, 1899 at Washington, D.C.

Edward B. Russell
Curator, US Army Engineer Museum

United States Army Engineer School Fort Belvoir, Virginia

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Okay readers, we know what you're thinking — THE ENGINEER has hopped on the bicentennial bandwagon and joined the ranks of those countless bores who promote red, white and blue Christmas trees and star-spangled knee socks.

But wait just a minute now! Roll those eyeballs back down from the ceiling and give us a chance.

Our intentions in preparing this cover went beyond cramming 200 years into an 11" x 15" box and snapping a picture. There's a genuine celebration here of the Army Engineer Corps' role in our nation's proud history — from the glorious 8-year struggle that fathered out neophyte republic through the civil war that threatened to destroy her; through two world wars and two police actions; through intervening eras of prosperity and despondency to new-found outlooks and hopes for a brighter future.

Blow out the candles and make a wish; life just begins at 200.

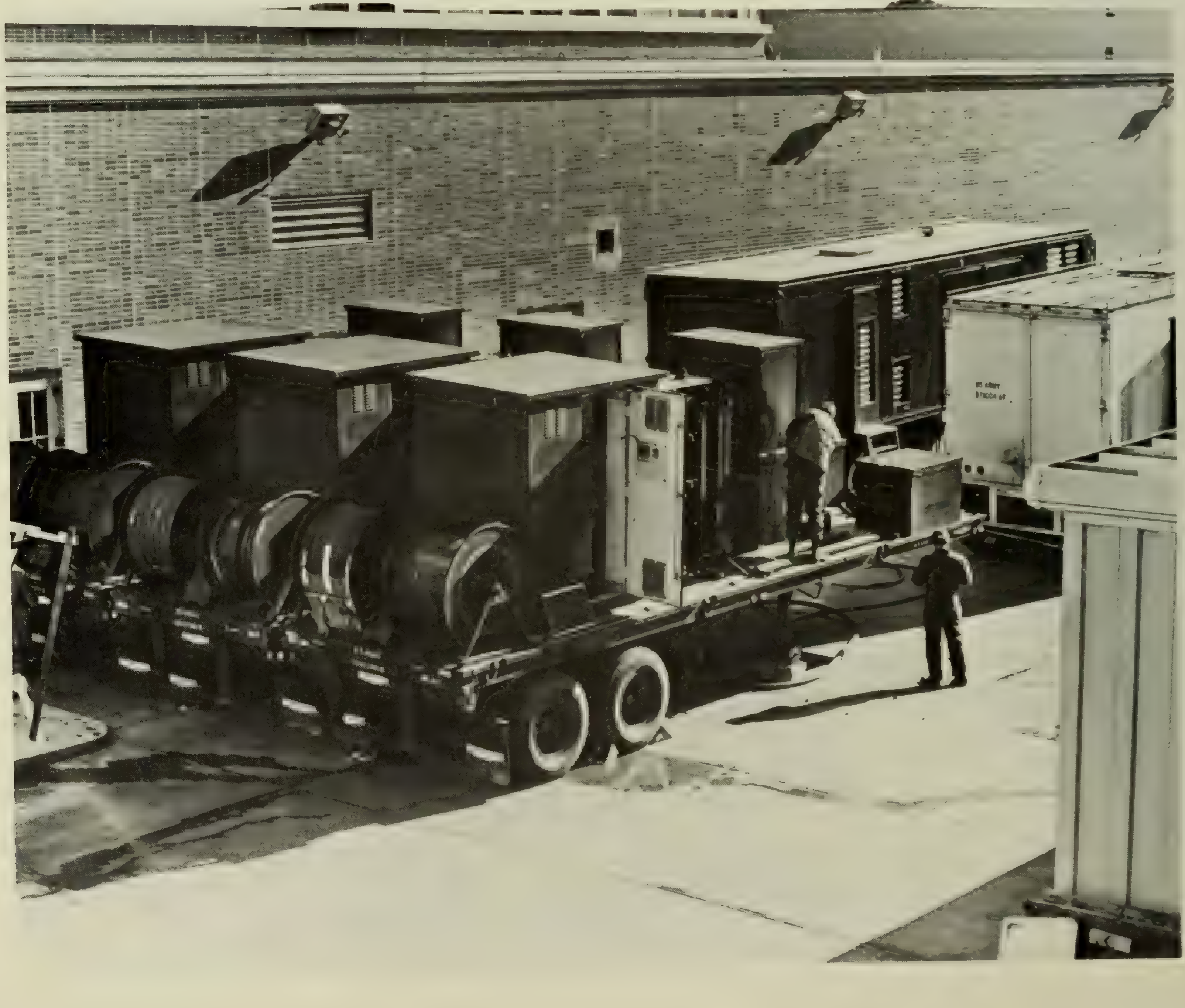
Models by Chris Savage

.PIPELINE. PIPE

ARMY PROVIDES STANDBY POWER FOR VA HOSPITAL

When the Veterans Administration Hospital, Washington, D.C., recently had to remove its 1500-KW standby generator from service to obtain necessary maintenance, the Facilities Engineering Support Agency (FESA), Fort Belvoir, responded to the call for emergency standby power. On 13 January, FESA deployed two 750-KW gas-turbine-driven generators and three 500-KVA substation transformers to the hospital. Military technicians from FESA connected these units to the emergency bus of the hospital where they will remain on standby duty for several weeks while maintenance proceeds on the hospital's own standby generator.

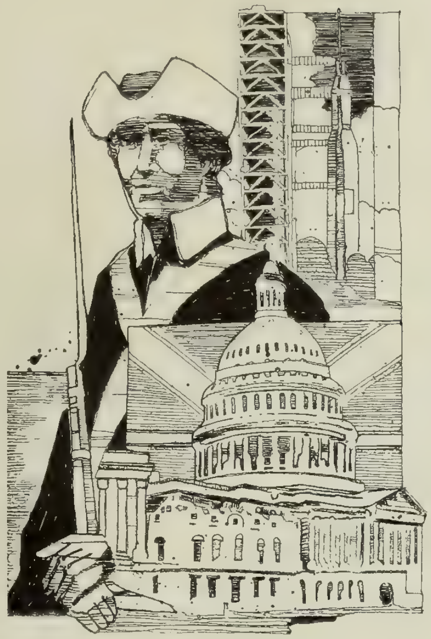
The 750-KW generator vans are used by FESA to carry out its mission to supply power on an emergency basis for periods up to 6 months. These vans are transportable by land, sea, and air and can be hooked up and made operational within 72 hours after arrival at a site. One of the most spectacular examples of this service occurred when the Kodiak king crab processing plants were supplied with emergency power by flying generators to the island.



LINE. PIPELINE.

WE WERE THERE . . . BUT NOT FOR CONQUEST

This is the title of the new Corps of Engineers Bicentennial film produced by OCE. Running 28 minutes in color, this 16mm film depicts the role of the US Army Engineers in the development of our country and the contributions made by the Army Engineers in peace and war for 200 years. The film traces the history of the Corps from its inception in 1775 to the present. It is available from the OCE Divisions and Districts on a loan basis. When ordering the film, give the name and address, including zip code, of the person and/or organization assuming responsibility for the film.



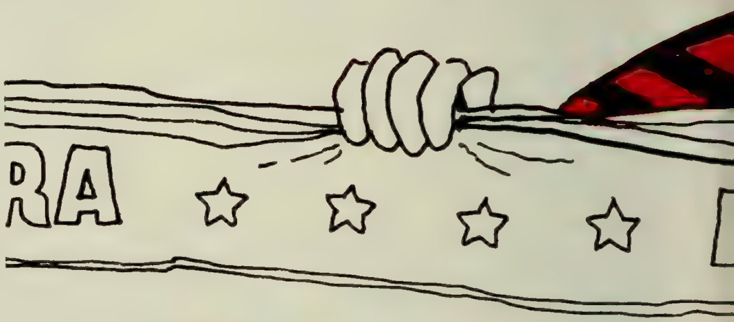
ENGINEER ARTEP PRODUCTION

The Army Training and Evaluation Program (ARTEP) are written by the Collective Training Division, Directorate of Training Development, USAES. Currently eleven ARTEPs have been programmed to cover the different types of engineer units. Below is a chart showing these proposed ARTEPs, the editions in print, dates of publication, and current status. Those indicated as final editions are DA printed and are available through AG publication channels. Test editions may be requested through:

US Army Engineer School
Department of Army Wide
Training Support
Fort Belvoir, VA 22060

ARTEP	UNIT	EDITION	DATE	STATUS
5-145	Engr Bn, Armd & Mech Div	Test Final	Jul 74 Sep 75	Superseded Approved For Use
5-25	Engr Bn, Abn, Aslt & Inf Div	Test	Jan 76	Approved For Use
5-35	Engr Cbt Bn, Corps	Final Revised	Aug 74 Mar 76	Superseded (Supply Exhausted) Approved For Use
5-115	Engr Cbt Bn, Heavy	Test Final	Apr 75 Jun 76	Approved For Use (Supply Exhausted) To be Published
5-64	Engr Float Bridge Co	Test	Jun 76	To be Published
5-74	Engr Fixed Bridge Co	Test	Sep 76	To be Published
5-54	Engr Cbt Equip Support & Abn Light Equip Co	EXACT AVAILABILITY DATES NOT YET DETERMINED		
5-67	Engr Const Co			
5-335	Engr Topo Bn			
5-52	Engr Cmd, Bde and Gp			
5-500	Engr Cellular Tms			

HERE'S WHAT'S NEW—



IN TRAINING LITERATURE

2LT Ralph C. Davis

The United States Army Engineer School (USAES) continues to be in the forefront of TRADOC's reorganization and revitalization of training literature. In November 1974, TRADOC announced the *"1000 Good Books"* program which proposed a reduction of TRADOC's inventory from 1700 manuals to 1000. The role of the USAES is to reduce 188 manuals to 123.

However, this program is more than a simple reduction in quantity. It involves an upgrading of the quality of the literature and the production of several new important types of books.

A key element of the program is the *"How To Fight Manuals."* Lessons learned from recent and past conflicts about the effectiveness of modern armaments, the difficulties of survival and the complexities of modern warfare indicate that the old tactics are no longer adequate or applicable. The analysis of these *"lessons learned"* will be used in the *"How To Fight Manual"* to outline what must be done to win the first battle of the next war. The contribution of the USAES covers the employment of divisional and nondivisional engineer units in support of tactical operations.

The USAES has prepared a draft copy of FM 5-X, *"How To Fight Manual"* which replaces:

FM 5-135, Engineer Battalion, Armored Inf. & Inf. (Mech) Div

FM 5-136, Engineer Battalion, Airborne & Airmobile Div

FM 5-142, Nondivisional Engineer Combat Units

The revised manual describes the four basic engineer roles:

- Enhance friendly mobility
- Impede enemy mobility
- Provide protective and defensive shelter
- Fight as infantry

The draft edition is presently in the field for review. In addition, the USAES is nearing completion of a draft copy of another *"How To Fight Manual,"* FM 90-7, *"Barriers, Obstacles and Denial Operations."* This will replace FM 31-10, *"Denial Operations and Barriers."*

Another important element for which the USAES has responsibility is the production of the *Soldiers Manual.* Detailed information can be obtained from an article, in the Oct-Nov-Dec 1975 issue of The Engineer, by CPT Robert Formo entitled, "The Engineer Soldier's Manual."

Training Circulars (TCs) continue to be a good means for quick coverage of a single topic. The USAES is currently producing TC 20-32-2, *"Employment of the M-56 Helicopter Delivered Mine System"* and TC 5-210, *"Maintenance Tips To MAB Platoon Leaders."*

TC 20-32-2 provides guidance to the commander and his staff at battalion level or higher on the employment of the M-56 Scatterable Mine System. It explains the characteristics of scatterable mines, density, command and control measures, and reporting. TC 5-210 is a collection of tips gathered from experienced MAB platoon leaders with a handy set of checks to assist his unit in maintenance. Safety hazards, checks, and services and maintenance plans are discussed.

ENGINEERING LIBRARY

Over the past several decades, the nature of combat has changed significantly. Never before has the US been faced with the challenges of the battlefield. The TRADOC Bulletins help meet this challenge by providing timely information on weapons, tactics, and training. They also explain why we fight the way we do. The USAES has provided input to the recently published TRADOC Bulletin No. 6, *"Countersurveillance and Camouflage,"* which describes the advantages of camouflage techniques and materials such as pattern painting, improved camouflage paint, and the lightweight screening system. In addition, it discusses principles that must be employed by commanders to avoid enemy detection by visual, infrared, and radar devices. It also re-emphasizes the importance of camouflage fundamentals and camouflage discipline.

Along with the new types of training literature being developed, the Field Manual continues to be important. The USAES is currently involved in the revision of several FMs applying innovative presentation methods, and using layouts, illustration and typography to enhance them. The manuals nearing completion are FM 20-32, *"Mine/Countermine Operations,"* and FM 5-34, *"Engineer Field Data,"* commonly known as the "Bible" for engineers.

The old standard, tan-covered FMs and TMs are rapidly becoming obsolete. Today's innovative styles, techniques, layouts, and up-to-date information are a necessity if the increasing demands of the modern Army are to be met.

2LT Ralph C. Davis is currently assigned to the Directorate of Training Developments, USAES. He holds a BA Degree in Sociology from Norfolk St. College and is a graduate of the Signal Officer Basic Course (SOBC) at Ft. Gordon, Georgia.

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THIRTEEN HOURS TO BATTLE

Lt. Gerald T. Hopkins

Colonel Richard Gridley was old when the Revolution began. He had just turned 65, and many of his fellow officers believed he was too old to be a good soldier. Yet, the years which bestowed age also bestowed experience.

Gridley has studied under the British military engineer John Henry Bastide, who prepared the fortifications of Boston. During the Colonial Wars of Great Britain and France, Gridley supervised the engineering requirements for the seige of Louisborg. He built Forts Halifax and William Henry, and served under Wolfe in Quebec.

Several years prior to the Revolution, Gridley retired from the Army and settled in New Hampshire, ready to enjoy the lazy days of his golden years. The Revolution interrupted his respite and dragged Gridley from retirement. Yes, he thought, he really was too old for another war. Nontheless he took the job as Chief of Engineers for Massachusettes—a call more to Bostonian loyalty than patriotic fervor.

The war had been going badly for the colonists. Realistically there could be no other course for the war, considering the capabilities of the British Army and the colonial militia. Gridley knew this. Why couldn't he be back in a good regiment with proper British sappers to construct fortifications? Instead, he headed a motley group of farmers, blacksmiths and colonial vendors who didn't know the difference between an irrigation ditch and a redoubt. War did bring hardships; the lack of skilled military engineers was just one more. Gridley tried to remember the last time he had a good cup of English breakfast tea. Just another hardship.

Everyone knew that a British attack was imminent at either the Charlestown Peninsula or the Dorchester Peninsula. Both offered the tactical advantage of the hills which overlooked Boston Harbor and the Charles River. General Howe had boasted of his intention to take the Charlestown Peninsula, which offered Moulton's Hill, Breed's Hill and Bunker Hill. The British would commence their attack on the Charlestown Penisula at 1300 hours, 17 June 1875.

Colonel Gridley remembered the staff meeting he attended the evening before. He was still angry over the final decision. The officers debated on how to defend the Charlestown Peninsula. Gridley wanted to construct the main fortifications on Bunker Hill — the tallest hill on the peninsula — and use the other two hills as outposts. He reasoned that since it could not be flanked, being so close to the peninsula neck, Bunker Hill was the obvious. He argued that if Bunker Hill could be fortified and defended, it would be impregnable.

The others wouldn't listen. General Putnam asked for a consensus. "Old Putt" favored the Breed's Hill fortifications. The General figured that if the hill displayed the main defense, the colonists could strike the British as soon as they landed and use Bunker Hill as a "fallback" position.

Gridley thought, "What does Putnam know anyway?" Putt was just an illiterate farmboy at heart, even with his multitude of combat experience. After all, Gridley was the chief engineer.

A vote was taken and the officers "agreed" to fortify Breed's Hill first — a decision they, later, openly regretted.

The midnight air was chilly for Boston in June. The cold air carried noises much farther than usual, or so it seemed. The streets of Charlestown were unnaturally quiet in anticipation of the oncoming British attack. Colonel Gridley devised a strategy for the defense.

He would construct a redoubt and one hundred yards of breastwork extending northeast on Breed's Hill. Farther to the north he would build a stone wall or rail fence blocking passage to Bunker Hill by flanking Breed's Hill. There were now 3000 colonists on the peninsula, only a third of whom would construct defensive fortifications. Gridley had even less men under his direct control. He had thirteen hours to construct all the necessary fortifications before the British attacked.

The colonists were inexperienced in engineering and were working at night. Absolute silence was demanded — no talking, only muffled digging. Gridley strained his weary eyes to visualize his plans for Breed's Hill. He saw lights on the water — these belonged to the confident British casually awaiting the next day in their mighty "ships of the line." He saw ragged men working in the darkness with primitive tools, stripped of speech, yet spirited and determined. Gridley felt strangely proud and confident.

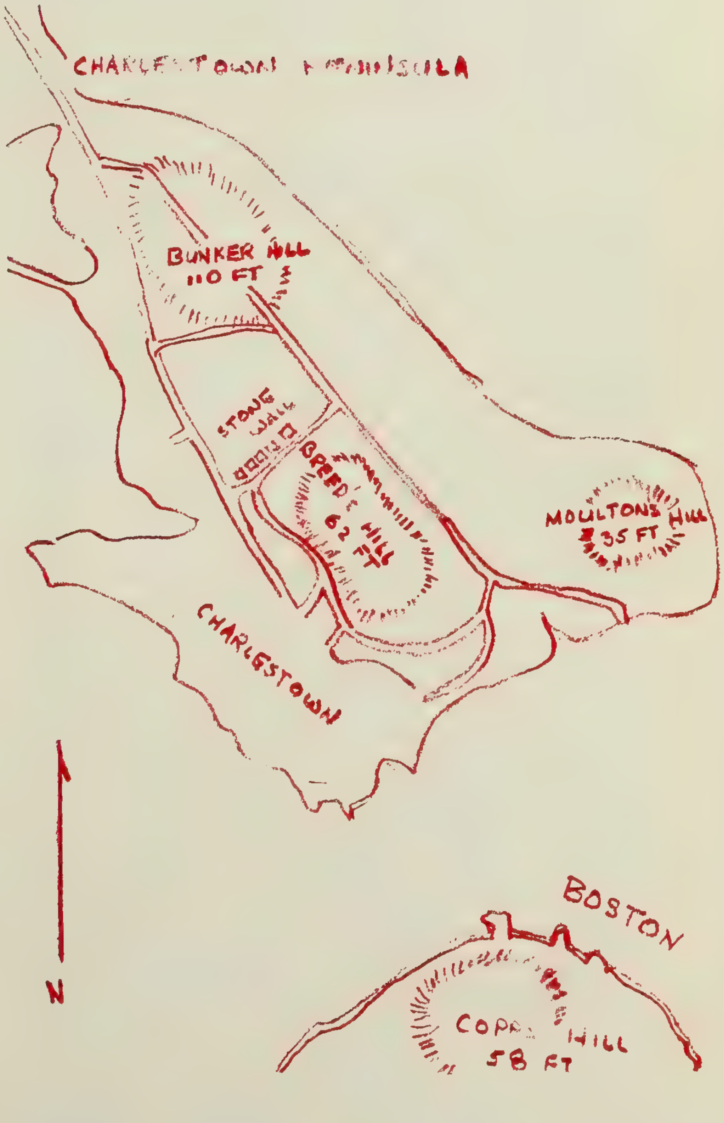
At 0400 hours, the daybreak cast faint light on the newlybuilt fortifications on the peninsula. General Gage was awakened aboard the sloop *Lively* and could not believe his eyes. He saw veritable fortifications on Breed's Hill where several hours ago none existed. He examined an earth mound about 150 feet square; probably a redoubt he thought. He noticed some type of breastwork extending in a linear fashion and packed behind timber retainers. At first Gage was startled; then he became amused. He enjoyed the fox hunt more than the rabbit hunt.

An order was given to start a bombardment; however, the attack would still commence at 1300 hours. As a British officer, Gage felt no real threat from the colonists. Let them eat cannonballs for breakfast!

At the first cannon shot, Gridley was impressed. He was not impressed by the aim of British gunnery, but rather at the ability of his redoubt to withstand fire. In a scant four hours the colonists had built a 45 yard square redoubt strong enough to resist British cannon fire all day. These were of earth, stone, and timber. The colonists added more earth and stone to the breastwork during the bombardment. The result: the fortifications actually looked larger, thicker, and stronger after the bombardment than before.

The colonists also built Gridley's "rail fence" — a structure framed by timber holding rocks and stone. This wall obstructed the attack route to Bunker Hill and was covered by the fire of the colonists. Gridley also emplaced green hay and grass in front of the wall. Although this provided no protection from British fire, it gave the wall a more formidable appearance.

Let the British come, Gridley mused. He had reason to be confident; his fortifications were strong, exceptionally strong. If the colonists could display as much determination in fighting as they did in engineering, the British could be beaten. Gridley peered over his redoubt, saw smoke on the water, felt the thud of cannonball into solid earth and felt secure.



CHARLESTON PENINSULA — 16 JUN 1775

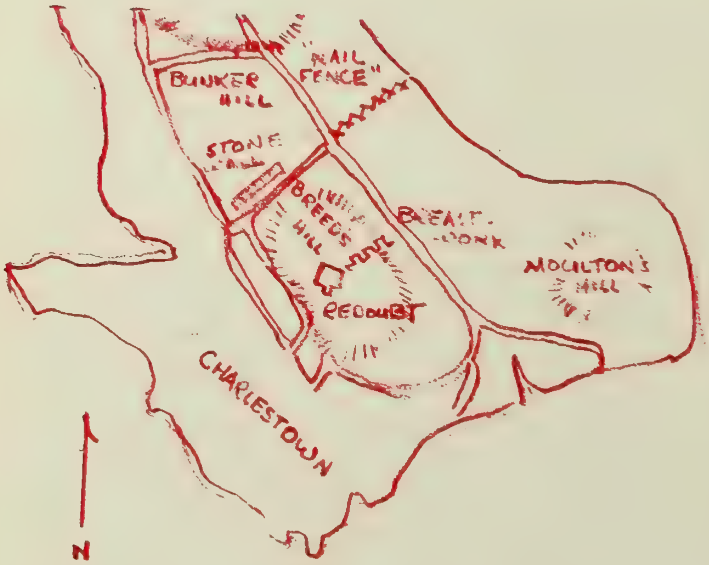
The British continued their barrage and the colonists scurried to replace any damage. Gridley suddenly remembered a warning to him earlier in his youth: always remember flank protection! Why was he thinking this now?

In the midst of battle, he spotted a weakness in his defenses. He had adequately provided frontal protection, but the northern flank on Breed's Hill was vulnerable. There was a gap hundreds of feet long between the last breastwork on Breed's Hill and the "rail fence" farther north. He would have to fortify this flank immediately.

He decided to emplace three fleches of v shaped obstacles built of earth and wood. Since time was short, little earth was packed against the timber; instead, Gridley used green hay to give a more formidable appearance while providing little protection. He smiled as he remembered a characteristic of the American fighting man — they hated to have their legs exposed to fire, but give them concealment up to their shoulders and they wouldn't worry about their heads!

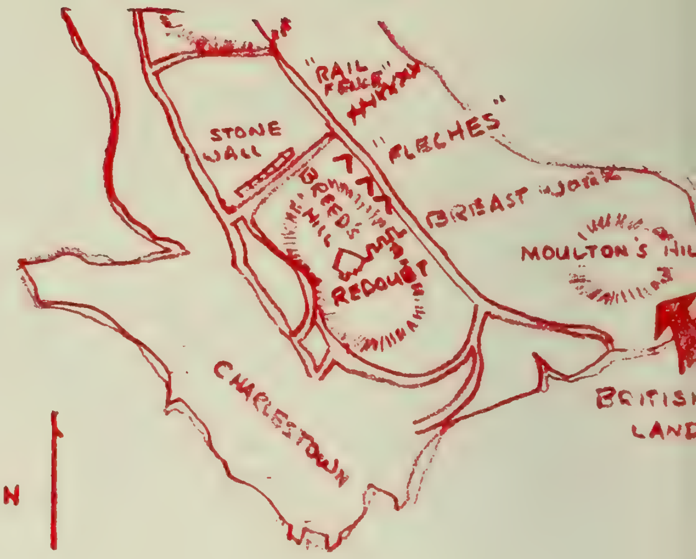
The fleches were built in record time. They served their purpose by obstructing the flank approach to Breed's Hill. The obstacle was enhanced by the militia defending it with fire. Now, Gridley confirmed, the colonists were completely prepared for the British attack. He noticed the sun hanging high in the sky; it was close to noon.

The Battle of Bunker Hill, as it became known, was won by the British. Sometimes during the three separate attacks on Breed's Hill, Gridley collapsed. This was the result of a combination of old age, exhaustion and small fragment wounds. As he was carried from the battlefield, his thoughts became random. Would death take him? What was the course of the battle?



BREED'S HILL — SITUATION 0400 HOURS — 17 JUN 1775

BREED'S HILL — SITUATION 1300 HOURS — 17 JUN 1775



Sure, the colonists had retreated, but not before inflicting enormous casualties upon Gage's attack force. Burgoyne later reported that the retreat was "no rout." One British soldier wrote a letter home stating that the rebels, "continued a running fight from one fence or wall to another, till we entirely drove them off the peninsula."

Official records tally British losses at about 1150 out of 2500 soldiers — 40 per cent casulaties. The British officer corps suffered the worst of the casualties. Of all the British officer casualties sustained during the Revolution, an eighth were killed and another sixth wounded at Bunker Hill.

Gridley mused about his fortifications. If the colonists had fortified Bunker Hill first, the British Army could not have conquered it, he argued.

The main reason for the militia's retreat was the critical shortage of ammunition. No defense could be conducted without firepower, no matter how strong the fortifications. The colonists had proved their will to win.

This battle was to be the first time that fledging American troops, colonial militia, were to hold their own against British regulars. Colonel Gridley's thoughts merged as he slipped into unconsciousness. His fortifications had held out; the ammunition had not. He was proud. He thought about that cup of tea.

Lt. Gerard T. Hopkins is a 1975 graduate of the U.S. Military Academy. He has completed Airborne School and 2-76 Engineer Officer Basic Course. He is currently the Executive Officer, Student Officer Detachment, USAESBDE, Fort Belvoir, Va.

ENGINEER TRAINING PACKAGES

MAJ Eldon R. Johansen

Can the reserve component engineer units accomplish combat engineer tasks? The purpose of this article is to share procedures which Army Readiness Region V (ARR V) is using to improve reserve component combat engineer hands-on training. These procedures have been effective and are recommended for use in other areas of the country. This article describes the engineer training packages which are used to provide hands-on training and discusses the reasons for setting up these packages. It will also cover the content of, experiences with, and changes to various packages.

Why do we need training packages? An example of the reserve component supply effort required to support hands-on training will best illustrate the requirement. Place yourself as the supply sergeant for a combat engineer company in a separate infantry brigade. Schedule installation, breaching, and clearing of a deliberate protective minefield as one of many platoon tasks during your two weeks of annual training (AT). Where do you get the materiel to conduct this training? You have TOE equipment, engineer tape, rope, and minefield record forms available in the unit. The Reserve Components Branch of the Directorate of Plans and Training at the AT installation will provide invaluable assistance in determining where to get other items. However, you must do the leg work. You will order and receive the practice mines and firing devices from your supporting ammunition supply point. You will order and receive dummy mines and blocks to simulate TNT from the Training Aids Support Office. You will coordinate to obtain a minefield marking set from the Installation Supply Division. You will borrow steel posts and barbed wire from the Directorate of Facilities and Engineering to mark the field. Your unit must remove the wire and posts from a fence that is no longer required. You will get wooden stakes from the Range Division of the Directorate of Plans and Training.

You will requisition materiel and submit authorization and signature cards during inactive duty training (IDT), several weeks prior to AT. The unit will send an advance party to sign for billets and to receive selected training materiel. This advance party will arrive late on Friday and the main body will arrive on Saturday. The issuing organizations will only be operational during normal duty hours. Therefore, your supply section cannot collect, consolidate, and issue materiel for training until several days into the AT period.

The net result will be that the platoons will spend a good part of their valuable training time waiting for supplies from the section or in locating, inventoring, receiving, and returning supplies themselves. The minefield example is probably typical of the supply effort required to support hands-on training for one engineer task. Tasks such as bridging, may require much less paperwork; however, more time is required for inventory. Tasks which destroy materiel, such as timber-trestle bridging and rigging, require comptroller coordination for funds.

The example of supply problems is a real life problem which is experienced by all units that plan for hands-on training. Similar real life problems deter site selection and training evaluation. In summary, the Engineer Training Packages have been developed to increase hands-on combat engineer training by accomplishing the following:

- Preventing loss of training time for supply actions by prestocking training materiel for immediate use.
- Preventing loss of training time by prior selection of and coordination for training sites.
- Providing training tasks with realistic performance standards so that the unit commander can properly evaluate additional training requirements.

- Providing a realistic alternative to site support work which often does not improve training.

To insure continued emphasis on hands-on training, ARR V established special coordination, supply, and assistance procedures for use of the Engineer Training Packages. The ARR V Readiness Group (RG) Engineer Teams are responsible for:

- Selecting and reserving training sites.
- Prestocking materiel and meeting the reserve component unit at the site with the non-TOE materiel required to support the training.
- Providing technical assistance as required.

Although the RG Engineer Teams provide materiel and advance coordination, the reserve component unit is still responsible for the following:

- Providing advance homestation training to the unit.
- Supervising unit performance on the job site.
- Providing TOE equipment.
- Evaluating performance to determine additional training requirements.

The first package was titled the Combat Engineer Training Package. This package included platoon level engineer tasks and a company level area defense problem. Initial results of the use of this package by 20 companies during AT74 exceeded the most optimistic expectations. The platoons were challenged, worked hard and enjoyed the satisfaction of completing difficult engineer tasks. Platoon leaders conducted hands-on training in combat engineer subjects without significant loss of time for logistics and coordination. Unit commanders determined the added training requirements for using units. Although platoon performance varied significantly, several overall comments are applicable:

- The Platoon Sergeants generally had the technical proficiency to supervise task accomplishment; however, squad leaders did not have this proficiency. Unit leaders had the leadership ability to supervise their men if they knew what had to be done. Unit advance homestation training did not properly prepare the unit to accomplish the task.
- Many platoons were a collection of individuals without a squad structure within the platoon.
- Units conducting repetitive float bridge training on lakes had developed construction, coordination, and safety procedures which are only applicable to still waters.

Revisions to the ARR V Engineer Training Package program were extensive for AT75. These changes were required because the original Combat Engineer Training Package was not a good tool for correcting the deficiencies noted above.

A Combat Engineer Squad Training Package was added. The purpose of this package is to develop squad proficiency in combat engineer subjects and to allow the squad leader to develop individuals into a working squad. Tasks for the squad package are listed in Table I.

COMBAT ENGINEER SQUAD TRAINING PACKAGES TASKS*

TABLE I

	TASK	HOURS TO COMPLETE
1.	Disable bridges.	4
2.	Construct barbed wire entanglement.	1
3.	Conduct ground recon to locate targets.	4
4.	Prepare a target folder.	8
5.	Breach artificial obstacles using explosives.	2
6.	Support assault phase of river crossing.	1
7.	Layout a Bailey bridge site.	1
8.	Construct an M4T6 fixed span.	2
9.	Construct a timber bent abutment.	4
10.	Conduct bridge reconnaissance.	4
11.	Conduct road reconnaissance.	4
12.	Construct corrugated metal pipe (CMP) culvert.	4
13.	Layout a 20 x 20 T/O building.	1.5
14.	Perform carpentry work.	1
15.	Construct shears, gin pole or boom derrick.	2

*Extracted from Letter, HQ, ARR V, Fort Sheridan, IL 60037, AFKB-RR-A-EN, 22 Nov 1974, subject: AT 75 Squad Training for Combat Engineer Battalions.

A Combat Engineer Bridging Package has been added. The purpose of this package is to conduct realistic float bridge training in moving water and to develop proper coordination between units. Tasks for this package are listed in Table II.

COMBAT ENGINEER BRIDGING PACKAGE TASKS*

TABLE II

1. Construct and dismantle a 600′ M4T6 bridge.
2. Construct, operate, and dismantle a trail ferry.
3. Conduct an assault river crossing.
4. Construct, and dismantle M4T6 and light tactical rafts.

*Extracted from Letter, HQ, ARR V, Fort Sheridan, IL 60037, AFKB-RR-A-EN, 7 Feb 75, subject: Combat Engineer Bridging Package.

The Combat Engineer Training Package was renamed the Combat Engineer Platoon/Company Training Package. This package was also changed to challenge the better trained unit and to provide combat engineer training to construction and utility units. Tasks for this package are listed in Table III.

A "teach the teacher" program was included in each package to better prepare leaders to supervise their units. This training is conducted at the reserve component unit's homestation prior to AT. Several procedures are used to accomplish this training. USAR schools sponsor and teach the classes for some units so that training can be conducted during non-IDT time with participants

TABLE III

COMBAT ENGINEER PLT/CO PACKAGE*

	BASIC TASKS	HOURS TO COMPLETE
1.	Construct a 60′ double single Bailey bridge.	4
2.	Dismantle a 60′ double single Bailey bridge.	4
3.	Construct a 4 float M4T6 raft.	4
4.	Dismantle a 4 float M4T6 raft.	4
5.	Construct a timber trestle bridge.	4
6.	Dismantle a timber trestle bridge.	4
7.	Install a 50 meter minefield of 1-2-2 density.	4
8.	Breach and clear a 50 meter minefield of 1-2-2 density.	4
9.	Construct a light tactical raft (LTR) and install anchor towers and cable for M4T6 floating bridge.	4
10.	Dismantle an LTR and anchor towers and cable for M4T6 floating bridge.	4
11.	Conduct a company area defense and night withdrawal.	4
	ALTERNATE TASKS	
1.	Construct a 120′ single single Bailey bridge with intermediate panel pier.	**
2.	Dismantle a 120′ single single Bailey bridge and intermediate panel pier.	**
3.	Defend a platoon defensive position to include complete preparation of minefield obstacles and fortifications.	**
4.	Bay load a 60′ double single Bailey bridge, haul to field location and construct at a field location.	**
5.	Remove Bailey bridge and restack.	**
6.	Conduct infantry platoon battle drill.	**
7.	Conduct closely supervised platoon demolition tasks.	**
8.	Conduct demolitions training for demolition personnel.	**
9.	Construct and dismantle a 330′ footbridge to include anchorage system.	**
10.	Assemble and disassemble M8A1, MX18b, and MX19 airfield matting.	**

*Extracted from Letter, HQ, ARR V, Fort Sheridan, IL 60037, AFKB-RR-A-EN, 10 Dec 74, subject: Combat Engineer Plt/Co Training Package.

**To be determined after criteria is determined and final site is selected.

receiving retirement points. Some units schedule training for part of the unit leaders on Saturday and the remainder on Sunday during a training weekend. Other units have scheduled this training for administrative drills.

Engineer Training Packages may be difficult to assemble at other installations. Conditions in ARR V were ideal to initiate this approach to hands-on engineer training. Conditions which contributed to the success of this program included the following:

- Forward-looking commanders that understand and support hands-on training in basic tasks.
- A supporting installation at Fort McCoy that is reserve component oriented. Strong installation support is essential to set up and operate these packages.
- A Readiness Group at Fort McCoy to accomplish advance planning, to collect materiel, and to establish training sites.
- A high density of engineer units in ARR V and a high density of engineer units undergoing training at Fort McCoy.
- A large US Army Reserve Equipment Storage Site at Fort McCoy to support required training with equipment.

What is the future of Engineer Training Packages? The training program for reserve component units is moving and dynamic. The packages must have the flexibility to meet changing unit training requirements. Repetitive use of the packages during succeeding ATs will increase the capability of using units. As capability increases, the reserve component leaders will be able to provide all on-site technical proficiency. They will also be able to provide "teach the teacher" instruction to new leaders within the unit. This increased unit capability will lower required RG support and enable RG personnel to focus on other activities.

As unit capability increases, the requirement for use of the tasks from existing packages will decrease. This will provide time in the unit training schedule for other more challenging activities and will also allow the materiel from the packages to be used for other purposes.

Materiel problems and lack of preparation time are limiting the quality of Army Training Tests and field training exercises. Materiel and sites for squad and platoon tasks in the Engineer Training Packages may also be used for unit proficiency testing. The packages have been modified to add the test capability.

The new Army Training and Evaluation Programs for engineer units include many tasks which are not included in existing packages. Materiel which is presently on hand will support most ARTEP tasks with the flexible control system which will be used for 1976 summer training.

Hands-on training must also be improved at the homestation for the reserve component units. Only 14 of the 38 training days available to reserve component units are spent at AT. Materiel from the Fort McCoy Combat Engineer Training Packages is being used at the homestation for the reserve component unit. Units transport the materiel to homestation, conduct the training and return the materiel to Fort McCoy.

Major Eldon R. Johansen is Chief of the Engineer Team, U. S. Army Readiness Region V Readiness Group, Fort McCoy, Wisconsin. He has commanded training companies at Fort Leonard Wood, Missouri; a service platoon in Germany; and an engineer light equipment company in Vietnam. His staff assignments have been at U. S. Army Communications Zone, Europe; U. S. Army Engineer Command, Vietnam; and the 809th Engineer Battalion in Thailand. His civilian education includes a bachelors degree in civil engineering and a masters degree with specialization in sanitary engineering. Major Johansen is a registered professional engineer.

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JAWZ

SFC Thomas W. Burruss

Suppose you heard a story like this:

A funny thing happened to me on my way to Thompkins Basin today. I met, would you believe, a talking Mobile Assault Bridge (MAB) named "MOE." "MOE MAB" to be exact, and he told me that his crew members had just received a brand new manual called "The Soldiers Manual for Mobile Assault Bridge (MAB) Operators." He was really excited, and his excitement prompted me to ask more about this wondrous new piece of literature. Our conversation went something like this:

ME: Tell me Moe, just what is a Soldiers Manual?

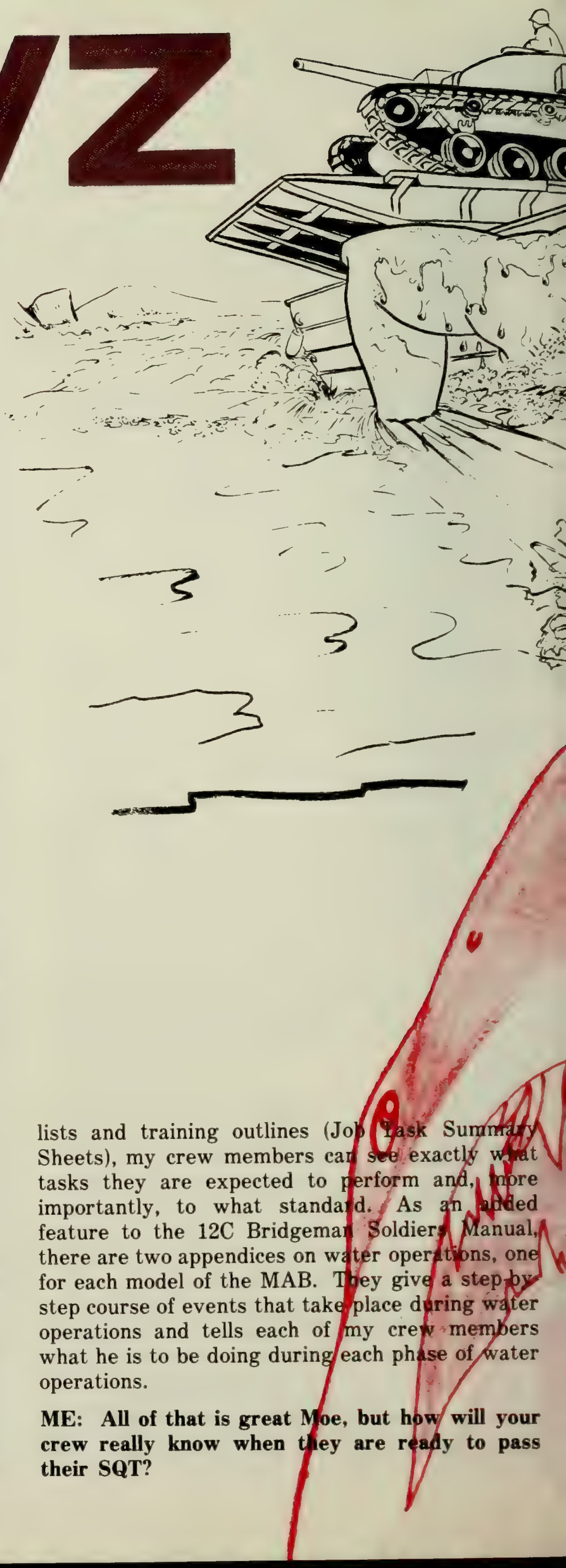
MOE: It is a manual that provides the individual soldier with a description of what the US Army and his superiors expect him to know and be able to do. It also provides a uniform training plan to be used by his unit commander and NCOIC for his OJT. You see, the basic objective of the manual is to qualify my crew members as efficient Mobile Assault Bridge operators. Once they have been trained in all the tasks outlined within the manual they can operate me effectively with a minimum of supervision. Upon completion of their training they should be able to pass the Skill Qualification Tests (SQT) given to determine their proficiency.

ME: Wow! It must be a pretty big book.

MOE: Not at all. The Soldiers Manual is designed under the new systems approach to training and while thorough, it is brief and concise so that my crew members can easily carry it anywhere they go.

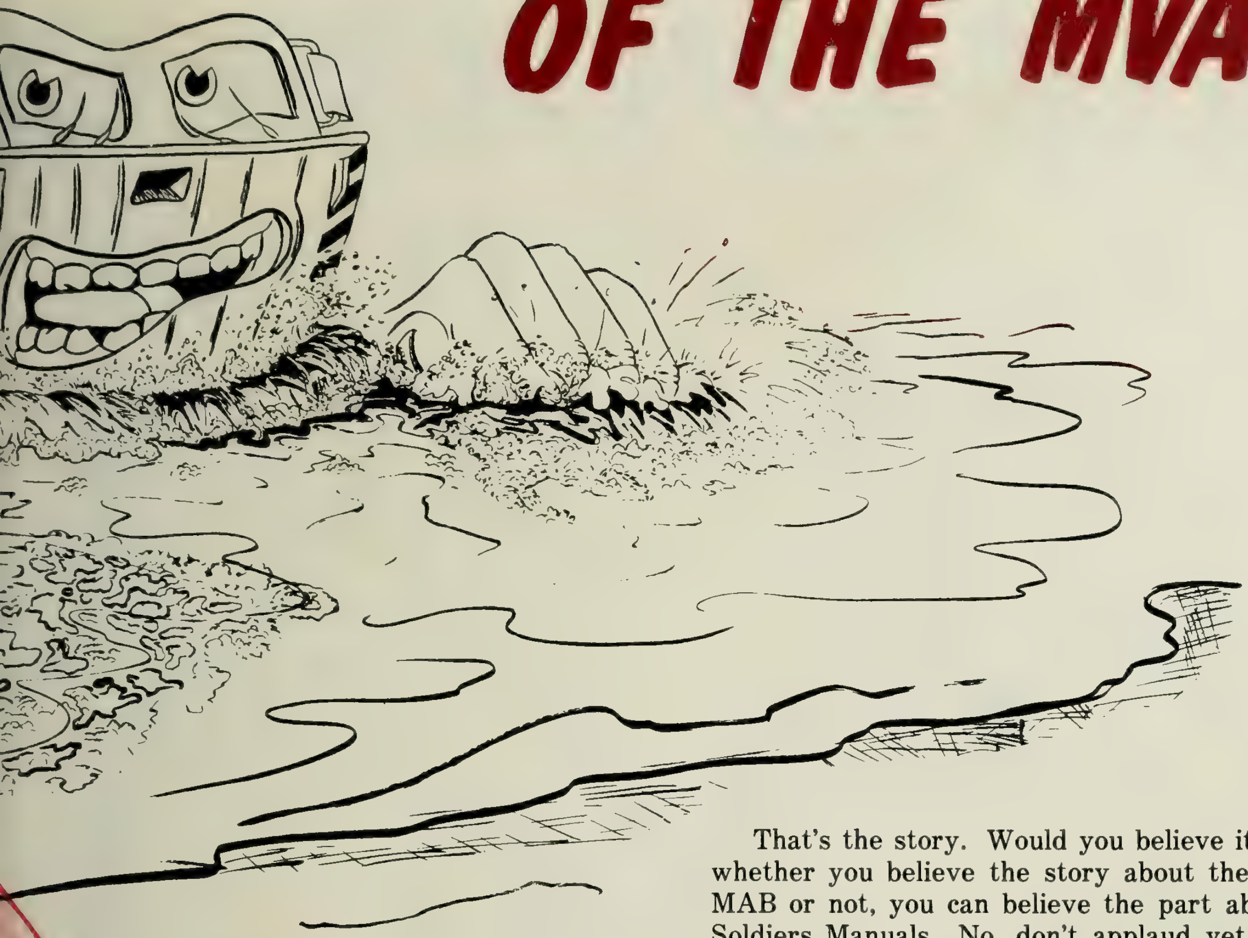
ME: Tell me more, Moe. What sort of subjects are contained in this Soldiers Manual?

MOE: Well, first the manual tells how to qualify for training as a MAB operator. Then it outlines the career progression of the Bridgeman to include his job description, his place within the Army, his career progression, and how he can supplement his training on his own. Through the use of its task lists and training outlines (Job Task Summary Sheets), my crew members can see exactly what tasks they are expected to perform and, more importantly, to what standard. As an added feature to the 12C Bridgeman Soldiers Manual, there are two appendices on water operations, one for each model of the MAB. They give a step-by-step course of events that take place during water operations and tells each of my crew members what he is to be doing during each phase of water operations.



ME: All of that is great Moe, but how will your crew really know when they are ready to pass their SQT?

OF THE MVA



MOE: In the back of the Soldiers Manual there is an appendix on Training Skills Development and another one on Training Evaluation. If my crew members can pass the tests in the Training Evaluation Section, they should be able to pass the SQT.

ME: Moe, this new Soldiers Manual sounds great. Where can I get one?

MOE: The manual is already in the field in draft form for validation by Army Mobile Assault Bridge units; however, the final copy will not be available until later in CY 76 when all of the CMF-12 Soldiers Manuals are to be completed.

That's the story. Would you believe it? Well, whether you believe the story about the talking MAB or not, you can believe the part about the Soldiers Manuals. No, don't applaud yet! We're not quite "out of the woods," but this type of manual is a "giant step," toward getting into the hands of operators a one-stop study guide for their particular MOS. We at the Engineer School believe we are headed in the right direction. Therefore, MOE MAB makes one request of you. If you have one of these Soldiers Manuals and have had a chance to review it, please write and tell us what you think of it. If the feedback is good, we're going to continue in this format for other MOSs. Remember, MOE is waiting to hear from you and so are we.

Sergeant First Class Thomas W. Burrus is a Project Officer for the Individual Training Divisin, Directorate of Training Development, USAES. A graduate of the Combat Engineer Non-Commissioned Officer Course (CENCO) in Germany and the Senior Non-Commissioned Officer Career Development Course at Ft. Benjamin Harrison, Indiana, he served with the 42d Engineer Company, Berlin Brigade, the 1st Engineer Battalion, 1st Infantry Division, and the US Army Recruiting Command in Philadelphia. His last tour of duty was with the 23d Engineer Battalion, Hanau, Germany, as a platoon sergeant and race relations, alcohol and drug counselor.

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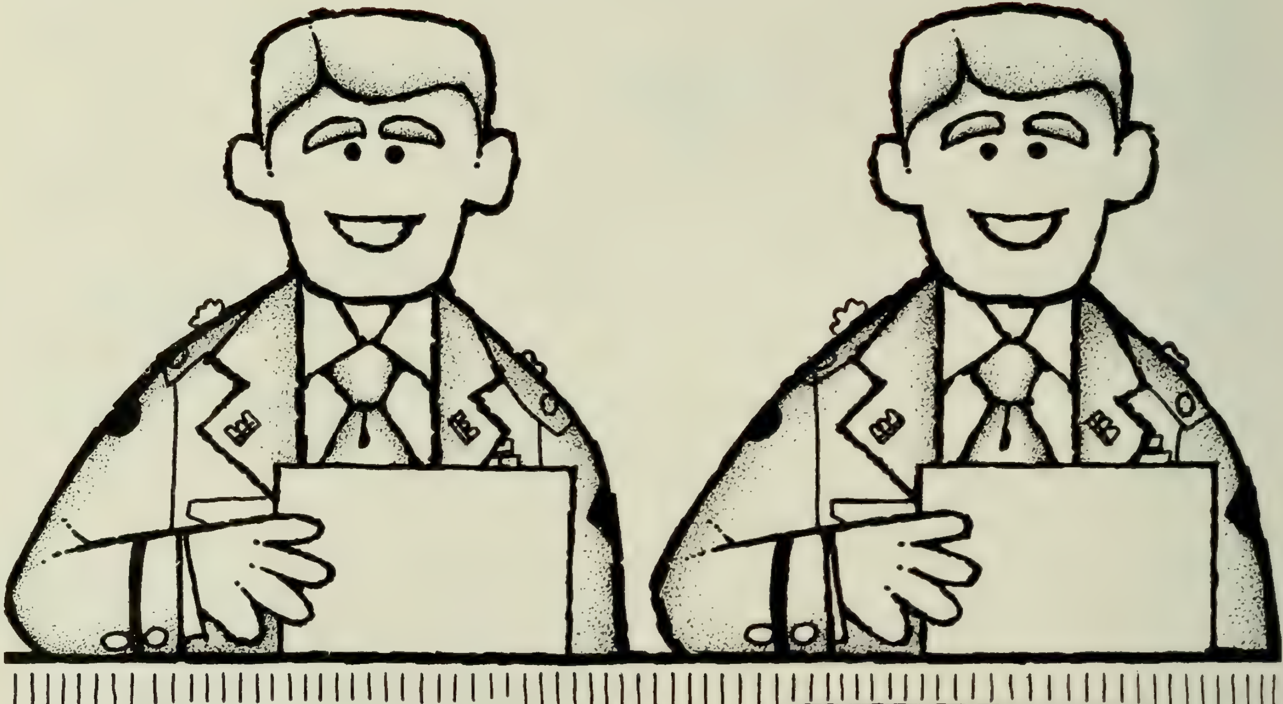
THE ENGINEE



LTC Edward G. Rapp

The Corps of Engineers

The Corps of Engineers is the world's largest engineering organization. It supports the Army and the nation by its military and civil engineering works. Nearly 5,000 commissioned active duty officers make up its military leadership. To be a successful engineer officer you must be a *soldier*, an *engineer* and a person willing to *dare* and *do*. The Corps of Engineers is a combat branch of the Army but service with the Corps as a member of the Engineer specialty is open to all qualifying officers without regard to branch. The thrust of this article is to provide insight so that you might assess your talents and examine your prospects for success as an Army Engineer under the Officer Personnel Management System (OPMS).

R SPECIALTY
AND
YOU

History

The Engineer history and heritage is long and colorful. The Corps of Engineers of today traces its lineage directly to an order given, on 16 June 1775, by General George Washington, appointing Colonel Richard Gridley as Chief Engineer. The first mission, prepare the defense of Bunker Hill against the British attack. But long before — back into the antiquity of organized battle — the art of war had been dependent in large measure on the skill and technology of its soldier-engineers. The Corps of Engineers is fundamentally a military engineering organization in which the ability to fight as infantry is inherent in its mission. All other missions — civil engineering, geodetic studies, civil works, scientific research and others — are offshoots. It is this basic purpose, that of engaging and destroying an enemy in battle, which US Army engineers must always be prepared to accomplish.

Job Functions of Engineer Officers

To better visualize the scope of the job demands to be placed on you as an engineer officer, we should look briefly at the functional areas within the **ENGINEER** specialty. These functions are described concisely in Army Regulation 611-101 as follows:

"Encompasses positions concerned with the tactical employment of engineer units. Evaluates intelligence, estimates situations, and formulates decisions. Coordinates deployment with other units. Commands attached elements. Directs communications, locations and construction of positions and camouflaging of positions and equipment. Directs employment of demolition munitions, barriers and fortifications systems. Optimizes the use of available engineer equipment, materials, and time to enhance mobility and combat power of the combined arms team. Directs topographic and geographic intelligence operations to include the production and dissemination of maps and geodetic data. Directs employment of engineer resources in military construction, facilities management and those civil works tasked to the Army. Directs training, administration, supply, maintenance, transportation and security activities of units. Prepares to fight as Infantry."

Within this broad specialty function, the Army has identified and categorized four major groupings of positions, all of which require similar skill qualifications and within which duties are closely related. These are Combat Engineer, Construction Engineer, Engineer Management Officer and Topographic Engineer. Listed below are descriptions of each of these job areas and the special skills necessary for success in the job at the basic level. For flexibility in personnel management and to meet combat contingencies, it is desired that officers be cross trained and obtain experience in as many of the following job areas as practical. As a general rule, the more duties that an officer can respond to with in-depth expertise, the greater his worth as an engineer officer.

Combat Engineer: Officers assigned to these jobs command or assist the commander or an engineer unit engaged in combat engineering. There are no specific prerequisite skill requirements; however, a degree in engineering or engineering-related disciplines is desired. Officers are trained to basic entry skill levels at the Engineer Officer Basic Course. Typical duty positions include assign-

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PROFESSIONAL DEVELOPMENT GUIDE *ENGINEER* SPECIALTY (21)

Fig. 1

PHASES OF DEVELOPMENT (GRADE AND UTILIZATION INDEX)	PROFESSIONAL MILITARY EDUCATION	CIVIL EDUCATION			SPECIALTY EDUCATION	ASSIGNMENT OPPORTUNITIES (NOT ALL INCLUSIVE)
		PROGRAMS		SPECIALTY DISCIPLINES AND COURSES		
COLONEL PHASE UTILIZATION INDEX (%) .77 Maximum utilization of developed Engineer managerial and executive talents in either Engineer specialty or alternate specialty.						Brigade/Group Commander District Engineer Engineer Staff Officer Facilities Engineer Topographic Engineer Instructor/PMS Advisor Recruiting Inspector General
LIEUTENANT COLONEL PHASE UTILIZATION INDEX (%) .70 Continue professional development in both Engineer specialty and designated alternate specialty.	Army War College Air War College Industrial College of the Armed Forces National War College Navy War College British Royal College of Defense Studies Canadian National Defense College French E'cole Superieure de Guerre Inter-American Defense College Army War College Non-Resident Course	COOPERATIVE DEGREE PROGRAM Prerequisites Attendance at Command and General Staff or Senior Service College. Discipline will support either this specialty or the alternate specialty. Normal period of study 6 months immediately after completion of above courses. Utilization Required SSC/CGSC none		REGISTRATION GOAL Registration as an Engineer in Training and as a Professional Engineer are desirable goals	Reference DA Pam. 351-4 Staff Officer Legal Orientation Senior Officer Preventive Maintenance Senior Officer Orientation Combat Operations	Battalion Commander Engineer Staff Officer Resident Engineer Facilities Engineer Topographic Engineer Instructor/PMS Advisor Recruiting Inspector General
MAJOR PHASE UTILIZATION INDEX .76 Continue professional development in both Engineer specialty and designated alternate specialty.	Army Command and General Staff College Air Command and Staff College Armed Forces Staff College College of Navy Command and Staff Marine Corps Command and Staff College School of the Americas Army Command and General Staff College Non-Resident Course		ADVANCED PROGRAM DCP (AR 621-1) Period of Study 18 months or less Utilization 3 years ADPRID (AR 621 101) Period of Study 15 months Utilization 3 years ROTC Fully Funded (AR 621 1) Period of Study 18 months Utilization 3 years Service Obligation Three years for each year in school or portion thereof, but not more than four years	PRIMARY SPECIALTY EDUCATION Graduate Education — Approximate Mix BUSINESS — 3% of Reqt ORSA Analyst Comptrollership ADPS Business Logistics Management Procurement ENGINEERING — 80% of Reqt Civil Engineering Engineering Management Aeronautical Engineering Nuclear Effects Engineering Chemical Engineering Engineering Physics ORSA Engineering ADPS Engineering PHYSICAL SCIENCE — 11% of Reqt Geodetic Science Topography & Photogrammetry Physics Nuclear Physics SOCIAL SCIENCE — 6% of Reqt Foreign Area Studies	Cost Estimating for Engineers Defense Contract Administration Defense Contract Law Engineer Const Contracting (Field Grade only) Facilities Engineering Mgmt Mapping, Charting, and Geodesy Nuclear and Chem Target Anal	Engineer Staff Officer Topographic Engineer Facilities Engineer Area Engineer Instructor Advisor Recruiting Inspector General
CAPTAIN PHASE UTILIZATION INDEX .82 Professional development thru assignments utilizing level of skills acquired thru Advanced Course Training. A continuous goal will be to afford as many officers as possible opportunity for company command.	ADVANCED COURSE (Alternate specialty qualifying education available thru resident and non resident instruction.)	UNDERGRADUATE DEGREE PROGRAM DCP (AR 621 1) 18 months or less Service Obligation Three years for each year in school or portion thereof, but not more than four years. *TOP 5% PRGM FOR USMA & ROTC DMG (AR 621-1).			Mapping, Charting, Geodesy Engineer Equipment Officer Camouflage Atomic Demolition Munitions Special Forces Officer (1Lt and above) Pathfinder Ranger Airborne	Company Commander Engineer Staff Officer Topographic Engineer Facilities Engineer Civil Engineer Pipeline Engineer Instructor Advisor Recruiting Officer
LIEUTENANT PHASE UTILIZATION INDEX .92 Commence development. Acquire basic military engineering knowledge and maximum practical leadership experience	Basic Course	Period of Study 18 months Utilization 3 years Service Obligation Three years for each year in school or portion thereof, but not more than four years *Effective with the class of 1978 the period of study will occur during fourth through tenth year		BASIC ENTRY EDUCATION UNDERGRADUATE DISCI DISCIPLINES Baccalaureate Degree in Engineering Applied Physical Science or Engineer related discipline desired. Each officer should have an undergraduate degree	Each officer should have an undergraduate degree.	Platoon Leader Company Executive Officer Engineer Staff Officer Topographic Engineer Training Officer

ments as commanders and staff officers in combat engineer battalions. Because of the combat orientation of these units, females are precluded. There are a limited number of positions in this duty field available to females. These are Engineer Staff Officer positions in organizations whose mission is not directly related to combat such as school, training, and research organizations.

Construction Engineer: Officers assigned to these jobs command or assist the commander of an engineer unit engaged in heavy combat engineering. The qualification and training for this duty field are parallel to that of a combat engineer. The difference is that these officers serve in combat heavy engineer battalions, port construction units, pipeline construction units, and other units engaged in heavy engineer construction roles.

Engineer Management Officer: Officers in these jobs command or serve on a staff in an engineer organization engaged in the management of the Army's civil works and military construction programs or in the operations and maintenance of installation facilities. To qualify for jobs in this duty field, an individual must have a bachelors degree in engineering or have equivalent military or civil experience or training.

Topographic Engineer: Officers in these jobs command or assist the commander of an engineer unit or organization engaged in topographic or geographic operations. Officers must have a bachelors degree in an engineering field or in geology, geography, geophysics, photogrammetry, lithography, geodesy, or climatology or have had equivalent practical experience and training.

The Officer Personnel Management System

The Officer Personnel Management System came into being in April 1972. The major objective of this system is to develop officers in the right numbers with the proper skills to satisfy Army requirements at successively higher grades to the grade of colonel. The major feature of the system is *dual* specialty development. This is a step away from the traditional generalist approach to officer development and a step toward specialization in two of the 46 identified Army specialties. The system is a rational approach which manages officers both by rank and by skill on multiple career pathways designed to provide the education and experience needed to meet Army specialty requirements of progressively greater responsibility and authority. Engineer is only one of the 46 Army specialties. All Corps of Engineers officers enter active duty service in the Engineer specialty but later in their career participate in depth in at least one other Army specialty. Officers from other branches may enter the Engineer specialty at their seventh year of service.

The professional development patterns available to officers in the Engineer specialty are diverse. Figure 1 shows a matrix of the types of duty assignments an officer might obtain as he progresses throughout a career. It is particularly important to note the objectives listed for each of the professional development phases of a career. Further, it is important to understand that an engineer officer does not spend his entire career solely in the engineer specialty.

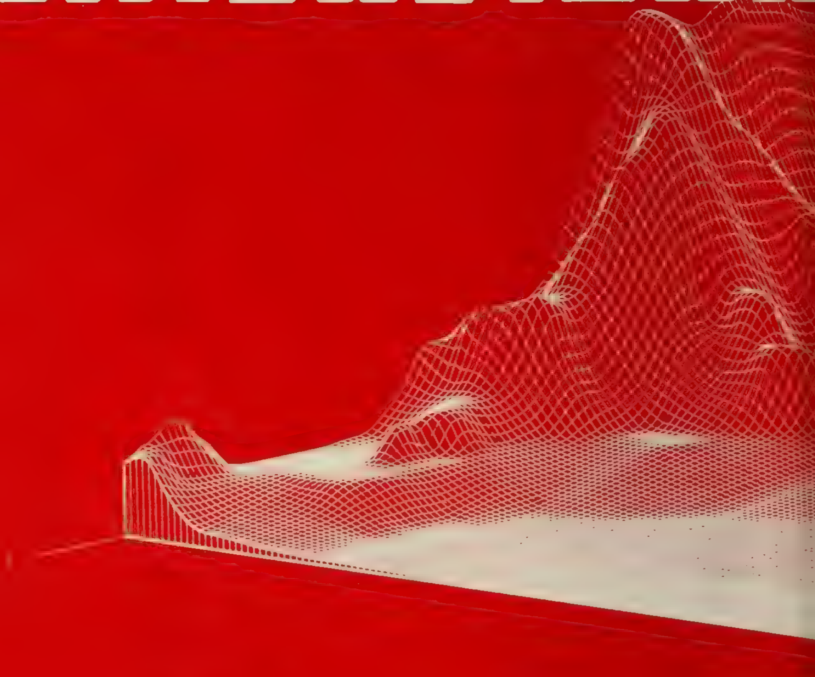
Success as an Army Engineer is primarily a function of an individual officer's ability to acquire and apply knowledge, skills, attitudes, and values related to the duties assigned. Individuals gain these qualities and attributes through study and experience. Some can only be gained by study or other vicarious means. We still believe that the central quality and attribute for success as an Army engineer, in addition to engineer skills, is the *ability to command.* While the ability to command remains a central quality and attribute, *actual command above company level is only one of many pathways to success for Army Engineers.*

Branch vs Specialty

Now that the theory of OPMS has been described, let's discuss the gut questions. Can an Infantryman survive in the Engineer specialty? Is the Corps of Engineers parochial or professional toward engineers in other branches? These are the critical questions that need to be assessed before an individual chooses Engineer as an alternate specialty. The answer is yes, the Corps of Engineers is parochial. We have a proud heritage, but that heritage was achieved through professional soldiering and engineering. But, if you are a professional soldier and have engineer skills, you can succeed no matter what branch brass you wear. All avenues to career success within the Engineer specialty are open. Further, the specialty is understrength, particularly at the grade of major, which makes your chances for success even better. The only questions that remain are: *Do you qualify?* and *Are you willing to accept the challenge?* If the answers are yes, the Engineer specialty needs you. You *can* serve with the United States Army Corps of Engineers. If you are already a member of the Engineer specialty — pass on the word.

LTC Rapp is assigned as Chief of the Plans Branch, Professional Development Division, Officer Personnel Directorate, MILPERCEN. He is a graduate of the Command and General Staff College, holds a masters degree in civil engineering and is a registered professional engineer.

THREE DIMENSIONA



James R. Jancaitis

Knowledge of the "lay of the land" has long been an obvious necessity for people from many sectors, both public and private. On topographic map sheets, description of the form or shape of the earth's surface is accomplished by the use of contour lines. A contour line is the projection on a map of an imaginary line on the earth, every point of which is at the same elevation. By combining contour lines for numerous, usually equally spaced, elevation values, a two-dimensional representation of the terrain is created by the cartographer. The visualization of terrain from the relief information (contour lines) contained on a standard map sheet, however, has long been recognized as a problem for large numbers of people who must use these maps in the day-to-day performance of their duties. This difficulty of getting an accurate "mental picture" is due in part to the difficulty encountered by the cartographer in portraying the three-dimensional surface utilizing only lines on a two-dimensional sheet. This approach has been adapted for presentation of terrain relief because it is the only method which allows for the accurate, simultaneous portrayal of both ground elevation and cultural information, correctly registered and scaled. Acquisition of the data required to produce the contour lines is a time consuming and expensive process normally involving high-resolution aerial photography, sophisticated electro-optical equipment and highly skilled personnel.

Some time ago the U.S. Army Engineer Topographic Labratories (USAETL) at Fort Belvoir, Virginia, pioneered the development of the Universal Automatic Map Compilation Equipment (UNAMACE) which greatly increased the speed with which the basic elevation data can be gathered. One of the products of this equipment (or its predecessors) is a digital terrain model (DTM), a fine, equally spaced grid of terrain elevation measurements. Currently, the DTM is utilized to produce the desired contour lines via

TERRAIN DISPLAY

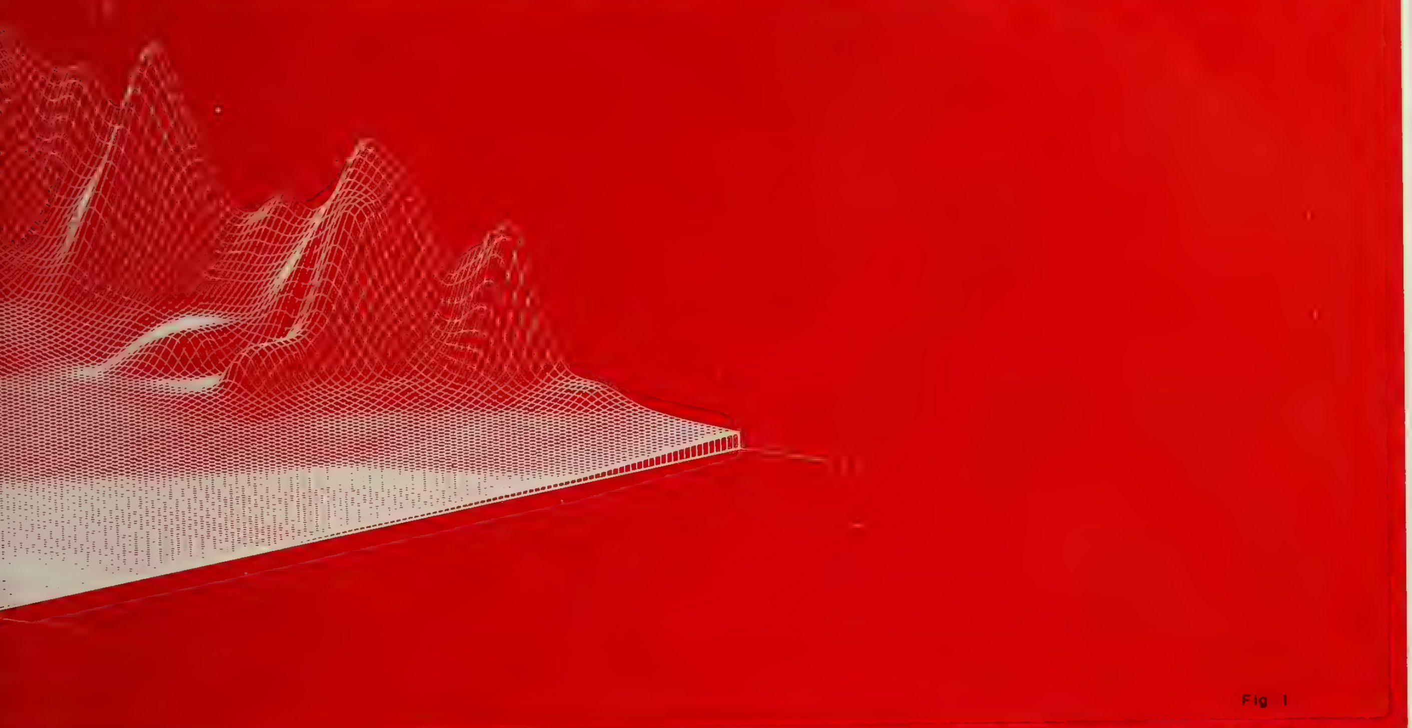


Fig 1

efficient computer programs. It must be emphasized that the use of UNAMACE, although more cost-effective and efficient than previous equipment and techniques, is still expensive and time consuming. It has long been known, and through background studies USAETL has demonstrated, that a more easily interpretable (though less "measurable") visual display of the terrain, a profile perspective view, can be formed via computer processing when the DTM is available. The profile perspective view of a surface is generated when a rectilinear grid is laid on the surface and then viewed from some convenient vantage point (see fig. 1). The general effect is as though a luminescent fish net has been placed over the terrain and then viewed in the dark. Studies at USAETL have shown that three-dimensional terrain displays such as this can be generated in near real time on cathode ray tubes (television) utilizing minicomputers. Current technology would allow for the storage for immediate access of DTM s covering the area of approximately 200 — 1:50,000 map sheets. Development of a prototype system is planned for the coming years. Display sophistications envisioned include the simultaneous and selective display of vegetation, culture, and special purpose information.

Related tasks involving information contained in the DTM that will be concurrently investigated for solution by this system include line-of-sight, trafficability, areas of defilade, and fields-of-fire computations. Expected advances in digital computer storage technology could have a significant and favorable impact on the amount of area coverage available on-line. Using optical-video-digital disc technology, it is feasible to store up to 6,000 three-dimensional terrain maps, at a scale of 1:50,000, on one small (12" diameter) flexible disc. The major problem foreseen for implementation of a field system is the creation of the necessary digital data bases because of the time and expense required.

Mr. James R. Jancaitis is a project engineer at the U.S. Army Engineer Topographic Laboratories (USAETL), Fort Belvoir, VA. Before joining ETL one year ago, he served as a principal investigator on DoD R&D contracts while on the staff of the University of Virginia in Charlottesville, VA. Mr. Jancaitis holds the BS degree from the College of William and Mary and a Master's degree in Engineering from University of Virginia. He has authored 26 technical publications involving 12 technical presentations.

10594-S

The Medal of Honor MacArthur *Almost* Won

Sp4 J. Arnold Montgomery

Scores of nations were already trouser-blouser deep in war when the former Army Chief of Staff was recalled from retirement and given command of U.S. Forces in the Far East. The move was intended as a warning to the Japanese—a reminder that America had her big guns in the ready for any nations pondering aggressive actions upon her third-world concerns.

The warning was ignored, and within five months the Japanese attacked at Pearl Harbor. Three weeks later they landed in the Phillipines, deploying large forces north and south of Manilla. The following three months' actions resulted in the Japanese conquest of the Phillipine Islands and a Congressional Medal of Honor for the Far East Commander's valiant defense of the tenuous Bataan Peninsula.

An so, another chapter was written in the legend of the flamboyant patrician-soldier, General Douglas MacArthur. An outspoken and controversial character from his West Point graduation in June 1903 to his dismissal from the U.S. Army in April 1951, MacArthur was lauded and vilified by his critics, blessed and damned by his peers. He was a hero to most who served him; an anathema to commanders who sought to control him.

He was a professional warrior whose credentials included two Purple Hearts, three Distinguished Service Crosses, seven Silver Stars, a Bronze Star, over sixty foreign decorations and, of course, a Congressional Medal of Honor. When his career ended abruptly in 1951, he was the most decorated soldier in the history of the U.S. military.

But there's another chapter in the MacArthur legend few people ever hear about. It's the story of a Medal of Honor MacArthur *almost* received for his role in an espionage mission during the United States occupation of Veracruz, Mexico, in 1914.

Diplomatic relations between the United States and Mexico had been anything but cordial since the assasination of Mexican President Francisco Madero in 1911. Madero was a "good guy" in the eyes of the U.S.; he'd replaced a "bad guy" dictator and showed promise of bringing democracy to Mexico.

But when Madero was shot from under his white hat, he was replaced by another baddie—a callous, reactionary general named Victoriano Huerta. President Wilson didn't care for the new leader, and he showed his displeasure by embargoing all arms shipments to the Huerta regime.

Further, Wilson demanded that all Mexico naval vessels give U.S. Navy vessels a 21-gun salute whenever they spotted an American flag prowling the Veracruz coast.

With understandable indignation, Madero refused. After all, the U.S. ships refused to show that courtesy to the Mexican flag. For a few weeks, the two nations were locked in a stalemate. Then President Wilson took action to resolve the matter—he sent in the military.

One week and 500 casualties later, the U.S. Navy and Marine Corps occupied Veracruz. Huerta retreated to Mexico City and Wilson sent in a brigade of 7000 from the 2d Infantry Division to secure his hold on the port city.

While President Wilson held his breath and prayed for the "little people" of Mexico to arise and overthrow their despotic leader, the War Department made preparations for an expeditionary force to advance on Mexico City. In the event of a war between the two nations, Major General Leonard Wood would command the march on the Mexican capital.

Mine eyes have seen MacArthur
With a Bible on his knee,
A-typin' out communiques
For guys like you and me.
"Our heavy bombers hit Rabaul
And God is filled with glee!"
While Mac goes marching on.

—U.S. Navy song

On April 23, 1914, General Wood detailed his aide, a 34-year old engineer branch officer, to prepare for a special intelligence mission "to obtain through reconnaissance and other means consistent with the existing situation, all possible information which would be of value in connection with possible operations." Nine days later, Captain Douglas MacArthur arrived in Veracruz.

Captain MacArthur reported to the commander of the occupying forces, Brigadier General Frederick Funston, and explained his mission. He was under orders from the War Department and would work independently of the general's command.

With over 11,000 of Huerta's regulars surrounding the Veracruz perimeter, the situation was, at best, sticky for the young officer. No amount of explaining or apologizing could prevent a war with Mexico if MacArthur was discovered snooping about the Mexican countryside behind Huerta's lines. On May 3, General Funston wrote in his diary, "Trouble is, we, not being permitted to scout beyond outposts, cannot discover a concentration made close there to. If a disaster should result from this condition, I must not be held responsible."

Meanwhile, back in Washington, General Wood was making plans for a possible attack on Jalapa. The idea was to send Funston's brigade forward and seize the town for an "advance base."

But the rainy season was on and Funston's forces didn't have enough mobility to break Huerta's lines and march on Jalapa—the only feasible approach would be to move the brigade by rail. There were plenty of railroad cars available but, alas, no engines.

Plans for the attack were at a standstill until a captain from the 4th Infantry Regiment struck up a conversation with a drunken engineer from the Mexican railways. The engineer revealed there were quite a few engines in Alvarado, a town 40 miles southwest of Veracruz.

And while possibly a rumor now,
Some day it will be fact
That the Lord will hear a deep voice say,
"Move over God, it's Mac."
—U.S. Marine Corps song

Upon hearing news of the precious engines, MacArthur offered the engineer and two of his companions $150 in gold to lead him to the treasures. The bribe was accepted, and on May 6, the foursome set out for Alverado by handcar. The trip went smoothly for MacArthur and his compadres; shortly after one o'clock the next morning, they pumped their way into Alvarado.

When they reached the rail yard, MacArthur was pleasantly surprised—three of the five engines they found were in excellent condition. The "meat" of his mission accomplished, MacArthur headed back for Veracruz.

The return trip proved much more eventful, as MacArthur later described in his report to General Wood:

"At Salinas, while moving around the town with one of my men . . . we were halted by five armed men . . . We started to run for it and they opened fire and followed us. We outdistanced all but two and in order to preserve our lives I was obliged to fire upon them. Both went down . . .

At Piedra, under somewhat similar circumstances and in a driving mist, we ran flush into about fifteen men of the same general type. We were among them before I realized and were immediately in the center of a melee. I was knocked down by the rush of horsemen and had three bullets through my clothes, but escaped unscratched. My man was shot in the shoulder but not seriously injured. At least four of the enemy were brought down and the rest fled. After bandaging up my wounded man we proceeded north with all speed available.

Near Laguna we were again encountered and fired upon by three mounted men who kept up a running fight with the hand car. I did not return this fire. All but one of these men were distanced, but this one man, unusually well mounted, overhauled and passed the car. He sent one bullet through my shirt and two others that hit the car within six inches of me, and I then obliged to bring him down. His horse fell across the front of the car and on the track, and we were obliged to remove the carcass before proceeding."

MacArthur returned to Veracruz unharmed and sent his report to General Wood. The information he gathered on the mission was never relayed to General Funston during the occupation of Veracruz, and the proposed attack on Jalapa never materialized.

In late November of that year, General Wood recommended MacArthur for the Congressional Medal of Honor, citing his former aide for "an amount of enterprise and courage worthy of high commendation."

He was the best soldier the United States produced during World War II.
—Field Marshall Viscount Montgomery

In mid-January, a board of officers from the General Staff was convened to consider the case. On February 9, 1915, the board decided:

"Captain MacArthur's distinguished gallantry in action consisted in making the reconnaissance at the risk of his life. But the board questions the advisability of this enterprise having been undertaken without the knowledge of the commanding general on the ground. . . To bestow the award recommended might encourage any other staff officer, under similar conditions, to ignore the local commander, possibly interfering with the latter's plans with reference to the enemy."

Although MacArthur contested the board's decision, criticizing the officers' "rigid narrowness and lack of imagination," the decision was never reversed.

But this was not the last time MacArthur would be recommended for a Medal of Honor and then refused it. There was also that time on the fields of France during World War I. But then, that's another chapter. . .

Specialist Montgomery is stationed with HHC, 2d Battalion, US Army Engineer School Brigade, Ft. Belvoir, Virginia. He graduated from the Defense Information School in December, 1973, and spent the following two years working for Army newspapers at Ft. Dix, Ft. Ord and the 2d Infantry Division in South Korea.

CONSTRUCTION UNIT

SSGT William S. Herridge

A "can do" attitude often isn't enough to get a military construction job done, as many construction managers learn once the task is begun. However, project disappointments might be avoided, if a plan devised by a Bryan, Texas-based Army reserve engineer unit, is applied.

The plan, called Construction Unit Evaluation System (CUES), was developed by members of the 420th Engineer Brigade's engineering staff. The plan, the Reservists say, can provide military construction managers with a quantitative measure of an engineer unit's productive capability—

CODE	DESCRIPTOR	TOE SKILLS
1	General	Construction apprentice, painter, lumber stacker, sawmill worker, fork lift op, sawmill yard worker, log scaler, cbt construction sp, cbt demo sp, pioneer, utilities helper, construction helper, lumber jack apprentice.
2	Surveyor	Const surveyor, rodman tapeman, construction survey recorder.
3	Carpenter	Carpenter helper, shipwright.
4	Electrician	Nuclear elec equip op, heavy, cable splicer, heavy cable splicer helper, high voltage lineman, substation elec, substation elec apprentice.
5	Plumber	Heating and vent sp, sheetmetal worker, pipefitter.
6	Mason	
7	Structures Sp	Rigger
8	Refrigeration Sp	
9	Diver	
10	Welder	Welder apprentice, blacksmith, marine welder
11	Pipeline Sp	Pipeline apprentice, pipeline truck driver
12	Marine Engr	Dredge crewman, assistant dredge crewman, crewman, assistant crewman, deckhand, assistant deckhand
13	LumberJack	Sawmill crewman, sawmill operator, timber cruiser, lumber grader tallyman, millwright
14	Crane Shovel Op	Hoist op, pile driver op, crane op
15	Loader Op	
16	Tractor Op	
17	Air Compressor Op	
18	Dump Truck (5T)	Heavy veh dr, heavy dump truck dr
19	Concrete Mech Op	Concrete production sp, cement mixer op
20	Grader Op	
21	Crusher Op	Quarry mach op, powderman, quarry wagon op, well driller
22	Ditching Mach Op	Intrenching mach op
23	Asphalt Distr Op	Asphalt production sp, asphalt equip helper, asphalt finisher op
24	Power Roller Op	
25	Water Distr Op	
26	Wash & Screen Op	
27	Nuclear Mech Equip Op	Boiler op, nuclear instrument op, radiation proc control sp
28	Generator Equip Op	Power genr equip helper, generator switchboard op
29	Powerboat Op	Harbor craft op, tender op, drag tender, leverman
30	Rotary Tiller Op	
31	Motor Scraper Op	
35	Indigenous Augmentation — Considered on theater-by-theater basis	

FIG. 1

EVALUATION SYSTEM

an important piece of data when planning a construction project.

CUES, according to its designers, isolates each construction skill, identifies personnel shortages, shows an evaluation of individual skill proficiencies, identifies the number of proficient manhours available per skill and per day, and assigns an overall capability index to the unit as well as to each skill involved.

The 420th engineers, commanded by BG O.D. Butler, had plenty of talent to draw from while devising the system, since most engineers in the unit are either practicing professional engineers or engineering professors at nearby Texas A&M University.

MAJ Rockwood Dunham, from the Office of the Chief of Engineers, provided assistance during the formative stages of the system. He was assisted by MAJ Jerry Selby, an engineer with the State Department of Highways and Public Transportation and now executive officer with the 871st Engineer Battalion in Austin; LTC Woodrow Free, civilian Staff Training Assistant and the unit's S-3; and MAJ Delton Kittrell, also a highway department engineer and head of the 420th's Engineer Section.

The system depends heavily on codes assigned to each construction skill represented in the construction unt. A study is then made on the proficiency level of each man in each of the 31 skill codes devised by the Reservists. (See Fig. 1)

Total authorized manhours are entered on the CUES worksheet, when manhours available at proficiency levels, or total adjusted manhours, are entered for each skill code.

The skill index, or actual percentage of proficiency for each skill code, is combined for all skill codes to arrive at an average unit index, or proficiency level.

SAMPLE — COMPANY B 871st ENGINEER BN TOE 5-118G — SAMPLE

MOS/SKILL	AUTH BY MTOE	MANHRS AVAIL FR MTOE AUTH 2	ASSIGNED PERSONNEL AT PROFICIENCY LEVELS IN PERCENT									MANHOURS AVAILABLE AT PROFICIENCY LEVELS IN PERCENT								TOTAL ADJUSTED MANHOURS AVAILABLE	SKILL INDEX	UNIT INDEX
			SHORT OR 0	20	40	60	80	1 100	120	140	160	20	40	60	80	1 100	120	140	160			
GENERAL	6	30	1					5								25				25	83%	
CARPENTER	18	90	3		2		2	5	4	1	1	4		8	25	24	7	8		76	84%	
ELECTRICIAN	12	60	4	1			2	4	1			1			8	20	6			35	58%	
PLUMBER	12	60	2					3	3		4					15	18		32	65	108%	
MASON	2	10			1			1					2			5				7	70%	
STRUCTURAL SPEC	2	10						2								10				10	100%	
CRANE SHOVEL 3	4	20	2			2								6						6	30%	
AIR COMP 3	2	10	1					1								5				5	50%	
CONCRETE MACH 3	2	10						2								10				10	100%	
DUMP TRUCK 3	12	60						12								60				60	100%	
WELDER 3	2	10									2								16	16	160%	
LOADER 3 4	4	20				1		2		1				3		10		7		20	100%	
CRAWLER TRACT 3 4	8	40	2	1		1	2	1		1		1		3	8	5		7		24	60%	
GRADER 3 4	6	30	2			2		2						6		10				16	53%	
POWER ROLLER 3	1	5						1								5				5	100%	
WATER DIST 3 4	2	10						2								10				10	100%	
WHEEL TRACTOR 3 4	6	30	[illegible]																	0	0%	
MOTOR SCRAPER 3 4	8	40		2		2	1	2			1	2		6	4	10			8	30	75%	
	109	545																		420		77%

Although the CUES form, Fig. 1-1, is fairly self-explanatory, a brief discussion of each portion of the table might prove helpful to construction managers wishing to apply the system to their own needs.

Column 1 is a list of construction skills in the unit. The list is determined by the manager, and should represent all construction skills in the unit. However, the list may be limited, for simplification, only to those skills which the manager considers critical.

While column 2 shows the number of men authorized by the Table of Organizational Equipment (TOE), column 3 establishes the number of manhours per skill that would be available at 100 per cent strength.

Column 4 displays the supervisor's own evaluation of the proficiency of each individual, and the number of men at each level in each skill.

Under that portion of the form, subcolumns identify the number of men in each skill who cannot perform at all, or who are just able to accomplish minimal tasks within the skill. At the top end of the evaluation are master craftsmen who can outperform those men rated at 100 per cent, according to criteria set down in Army publications.

The assigned personnel at proficiency levels column displays personnel shortages and the status of individual proficiency—information which indicates requirements for special personnel procurement efforts, training programs training projects and redistribution of personnel within the organization.

Columns 5 and 6 display computed manhours available for each skill. The figures are obtained by multiplying the number of men at a given proficiency level by the productive hours per shift, and by the respective proficiency factor.

The "total adjusted manhours per day available" represents the number of men with a given skill which an organization can mobilize each day.

The skill index, column 7, is obtained by dividing the available adjusted manhours by the manhours authorized by MTOE/TOE, representing the percentage of productive manhours the organization can mobilize based on the manhours authorized.

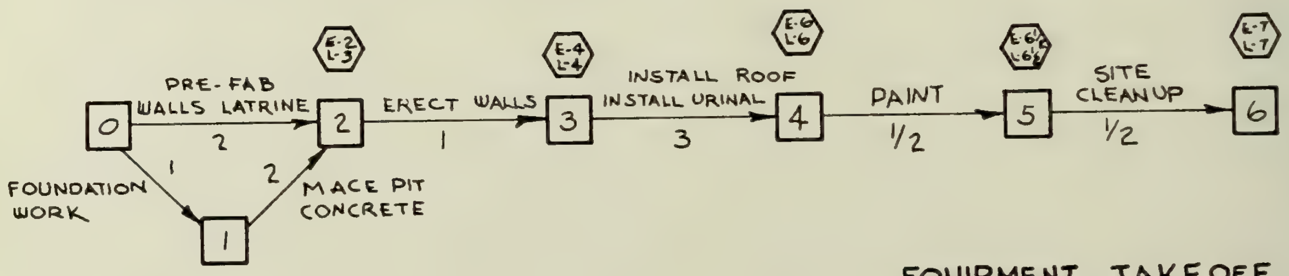
The unit index, column 8, represents the ability of a unit to complete its construction mission.

CRITICAL PATH METHOD
(CPM)
FOR
PROJECT PLANNING

MOS SKILL TAKEOFF

TASK NO.	MOS TITLE	MOS. NO.	EST. MH	ACTUAL MH UTILIZED
0-1, 0-2, 1-2 2-3, 3-4, 4-5	CARPENTER	51B20	245	
0-2 3-4	PLUMBER	51K20	40	
1-2	MASON	51D20	10	
0-1, 0-2, 1-2 2-3, 3-4, 4-5 5-6	DRIVER	64C20	525	

PROJECT CB-7 (B)-75



EQUIPMENT TAKEOFF

TASK NO.	EQUIP. REQ.	NO.	EST HOURS	ACTUAL MAN-HRS
0-1, 0-2, 1-2 2-3, 3-4, 4-5 5-6	2½ TON TRUCK	1	35	
1-2	CONC. MIXER	1	10	
0-1, 1-2 5-6	5-T DUMP	1	17.5	
0-1 1-2	LOADER	1	15	

FIG. 1-2

The percentage figure is based on the total of the adjusted manhours divided by the authorized manhours, and if used alone, could possibly mask significant strengths or weaknesses in a unit's capability.

Once the CUES report is prepared for a particular unit, only one step in the process of efficient construction management is completed. The CUES figures must then be related to the job at hand, to insure that each individual soldier receives maximum training, and, provided there is enough manpower, equipment hours available to complete the task.

The 420th accomplishes the marriage of input information for useable reliability rates through the use of critical path method (CPM) figures, troop availability reports, and equipment take-off consolidations.

TROOP AVAILABILITY — ANNUAL TRAINING 1974

FIG. 1-3

COMPANY B 871st ENGR BN
UNIT

SAN ANTONIO — TEXAS
HOME STATION

CAMP BULLIS, TEXAS
AT SITE

MOS JOB TITLE	MOS NO	NO. ASSIGNED	HR PER DAY CUES	TOTAL HOURS AVBL	MAN HOURS REQUIRED FOR EACH PROJECT (Estimate from CPM)						TOTAL ESTIMATE HOURS
					NO 1-74	NO 2-74	NO 3-74	NO 4-74	NO 5-74	NO 6-74	
Carpenter	51B20	15	76	760	36	120	89	247	138	0	630

The CPM is a graphic means of determining the relationships between tasks associated with any project, as the example in Figure 1-2 demonstrates. Troop availability provides the basis for consolidating the CPM requirements and CUES availability of the 31 skill codes to the construction mission.

The Troop Availability figures, as shown in Figure 1-3, receive Military Occupation Skill codes (MOS) and number assigned to each skill from the CUES report, and the hours per day input is taken from the CUES report in the Total Adjusted Manhours Available column.

Total hours available, therefore, is a simple multiplication of the hours per day times the number of available working days.

Manhours required for each project comes from the CPM as shown in Figure 1-2. This is the estimate made by the project officer/NCO of the hours of training by MOS number that he estimates will be required to complete the project.

EQUIPMENT TAKE-OFF CONSOLIDATION

FIG. 1-4

EQUIPMENT NOMENCLATURE	NUMBER ASSIGNED	EQUIPMENT REQUIRED FOR EACH PROJECT					TOTAL ESTIMATED HOURS
		NO 1-74	No 2-74	NO 3-74	NO 4-74	NO 5-74	
Dozer D-8	4	4	36	80	80	16	216

The equipment take-off consolidation table, Figure 1-4, then enables the CUES planner to judge what equipment will be available, and what numbers—also important information when planning the unit's ability to get the job done.

Each estimate is then posted to the Troop Availability sheet by project number, readily showing the estimated MOS utilization for each project, along with the total MOS utilization for the construction unit.

The total estimated hours, compared with the total hours available, provides the unit construction manager and unit commander with a good idea of where he has too many hours of training for his personnel by MOS, and, by the same token, if not enough training has been provided to adequately prepare his personnnel in the 31 critical skills.

In the example, the estimated hours is 630, while total available hours is 760, showing that the unit lacks 130 hours of carpenter training to satisfy the training needs of the carpenters. The manager, therefore, should request additional carpenter work on the coming project.

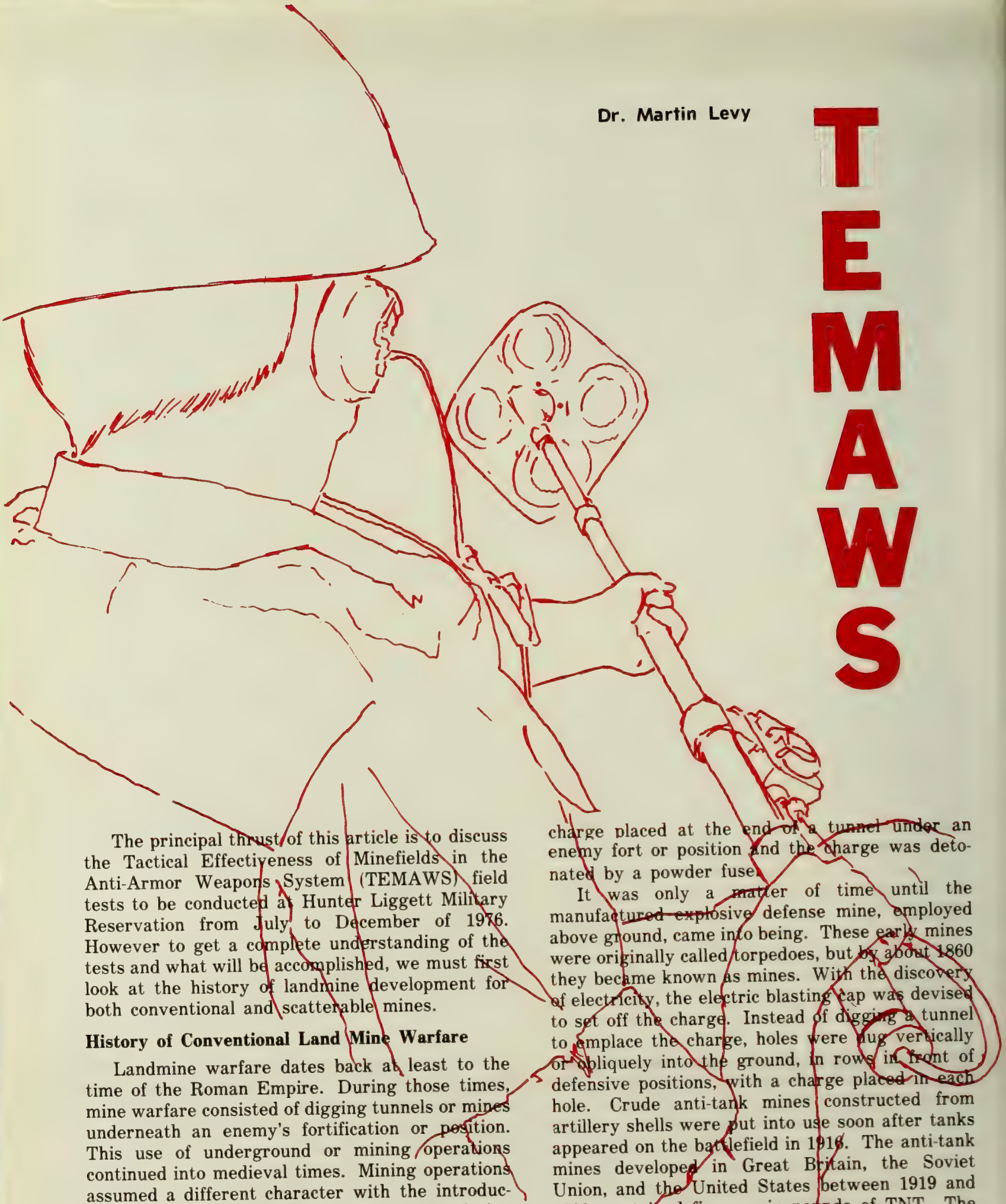
The engineers of the 420th are putting CUES to work for them to predetermine the capabilities of the Brigade's 34 subordinate units to accomplish the tasks assigned them.

While this discussion of the system is not a complete treatment of construction unit evaluation, the information and forms will enable you to put the system to work in your projects, to provide basic unit manpower capability information not normally available to the construction manager.

Staff Sergeant Herridge is an information NCO for the 420th Engineer Brigade, an Army Reserve engineer unit in Bryan, Texas.

Dr. Martin Levy

TEMAWS



The principal thrust of this article is to discuss the Tactical Effectiveness of Minefields in the Anti-Armor Weapons System (TEMAWS) field tests to be conducted at Hunter Liggett Military Reservation from July to December of 1976. However to get a complete understanding of the tests and what will be accomplished, we must first look at the history of landmine development for both conventional and scatterable mines.

History of Conventional Land Mine Warfare

Landmine warfare dates back at least to the time of the Roman Empire. During those times, mine warfare consisted of digging tunnels or mines underneath an enemy's fortification or position. This use of underground or mining operations continued into medieval times. Mining operations assumed a different character with the introduction of explosives; the first use of an explosive mine is recorded in Italy in 1403. This early use of mines to destroy an enemy's defenses was practiced in siege operations up to and during World War I. There "mines" consisted of a powder charge placed at the end of a tunnel under an enemy fort or position and the charge was detonated by a powder fuse.

It was only a matter of time until the manufactured explosive defense mine, employed above ground, came into being. These early mines were originally called torpedoes, but by about 1860 they became known as mines. With the discovery of electricity, the electric blasting cap was devised to set off the charge. Instead of digging a tunnel to emplace the charge, holes were dug vertically or obliquely into the ground, in rows in front of defensive positions, with a charge placed in each hole. Crude anti-tank mines constructed from artillery shells were put into use soon after tanks appeared on the battlefield in 1916. The anti-tank mines developed in Great Britain, the Soviet Union, and the United States between 1919 and 1939, contained five or six pounds of TNT. The emphasis in post-World War II research has been on explosive damaging mechanisms/capable of penetrating the hulls of heavy tanks, and on fuzes that do not depend on pressure for actuation.

Development of Scatterable Mines

While the improvement of mines continued subsequent to World War II, it was recognized that there was a need to reduce greatly the number of personnel and the time required to install a minefield, to leave areas free of mines until the last moment, to reduce the logistics by mining only where an enemy is or will soon be and to have a standoff capability to deliver mines. In addition, a degree of control over the duration of a minefield was required. To fulfill these requirements, a family of scatterable, self-destructing, light weight anti-tank (AT) and anti-personnel (AP) mines are being developed. Among these are a helicopter delivered AT mine, artillery delivered AT and AP mines, ground vehicle delivered AT and AP mines, Tactical Air (TACAIR) delivered AT and AP mines and quite probably rocket delivered AT and AP mines. [Each mine will have either factory set or field settable self-destruct times. The AT mines will have less than 1/3 the weight of present conventional mines, they will be dual purpose, that is, can give both a track and a belly kill, and have the capability to be emplaced at a distance from the delivery system, some can be emplaced in enemy held territory and rapid reduced effort is now possible.]

However, because of foreseeable severe dollar constraints it will be necessary to maximize capabilities with reduced resources. The Family of Scatterable Mines (FASCAM) Study looked at this problem mainly using simulation, subjective analysis and some minimum field tests.

FASCAM Study Recommendations

- The employment of scatterable mines should be included in future concepts of operation and doctrine for U.S. forces in both mid-intensity and low-intensity environments.
- Scheduled and future operational tests of scatterable mines should include in the test plans requirements to test and obtain data on detectability of AT scatterable mines under various operational conditions.
- Normal minefield densities of .001 mines per square meter should be recommended initially. Current doctrine on minefield depth appears to be adequate. However, doctrine should provide the option of sowing scatterable mines in belts.
- Scatterable mines should normally be employed in accordance with current doctrine which states that minefields should be covered by fire and surveillance.
- All U.S. Army doctrine should stress any measures which will force the enemy to close hatches or armored vehicles and thus enhance the effectiveness of our scatterable minefields.

Purpose of TEMAWS

It was determined that certain field tests would be required in order to react to the above recommendations. Therefore the TEMAWS field tests were proposed. The main purpose of the test is to provide data to the US Army Engineer School which will assist in the evaluation of the impact of scatterable minefield density (mines per square meter), patterns, detectability and synergism on anti-armor warfare doctrine and the logistics involved.

Objectives of the TEMAWS Test

In order to fulfill the purpose of TEMAWS, the following objectives must be accomplished. The test will:

- evaluate various densities of scatterable mines against a mechanized threat.

- evaluate the visual detectability of scatterable mines.
- compare the effectiveness of one continuous minefield versus several strips (belts) of mines using scatterable mines.
- evaluate the synergistic effect of minefields in the anti-armor weapons system.
- evaluate various densities of conventional mines against a mechanized threat.

Scope and Tactical Context

The five part experiment will be a two-sided, near real time loss assessment experiment to obtain comparative data on the effectiveness of minefields. Data will include time, position, engagement histories, and exchange ratios. A requirement for 54 experimentation days for execution of 108 trials and 16 experimentation days for exploratory trials is anticipated. A typical trial will consist of an engagement between a defending mechanized unit, consisting of approximately 5 APC mounted TOWs and DRAGONs supported by minefields, against an attacking threat armor unit consisting of up to 25 tanks and ATGM systems. The enemy forces will be determined by the US Army Intelligence Threat Analysis Detachment (ITAD) and by the U.S. Army Combat Development Experimentation Command (CDEC). Computer simulations will be run by CDEC to determine the size and structure of the defending forces which will provide credible results without giving either side an undue advantage. Indirect fire support will be simulated. The two-sided experiment will provide realistic stress and distraction and a means for quantifying the synergistic effect of minefields. Comparative data will be obtained using three threat tactics and four minefield densities including baseline trials using zero density.

Part 1 will be conducted using the most likely threat tactic against heavy, light, and zero density scatterable minefields. The resulting data will be analyzed immediately to assist in determining the minimum credible minefield density. Part 2 will be conducted using two different threat tactics against heavy, light, and minimum credible density scatterable minefields. Part 3 will be conducted using two different threat tactics against the minimum credible density scatterable minefield configured in three belts. Part 4, if played, will be conducted using two different threat tactics against light, medium, and heavy denisty conventional minefields. Part 5 will be with a credible density minefield but without covering fire.

Statistical Analysis

Appropriate statistical analyses will be made to:

- Determine the required number of trials for each part above.
- Determine the capability to detect and avoid scatterable mines.
- Determine the density to be used for a credible minefield of minimum density.

Scatterable Mine Simulator (SMS) System Characteristics

TEMAWS will be using a Scatterable Mine Simulator which is different from any mine simulator used previously. The major difference is that the SMS system will be made up of a receiver on the armored vehicle, and a radio transmitter in the mine simulator which continuously transmits on a given frequency. A mine "detonation" occurs when a vehicle passes over a mine so that the antenna on the vehicle picks up the very low power transmission from the "mine" transmitter. In general, the SMS System will be made up of three component groups:

- The mine simulator consisting of the transmitter, the housing and the power supply.
- The detector consisting of the receiver, the antenna system, the power supply, the housing, the mounting brackets and cables, and the interface unit.
- The test and checkout equipment consisting of the receiver test set and the transmitter test set which will also act as a mine simulator detector.

Conclusion

Successful TEMAWS tests will:

- Contribute to the data base available for future anti-armor weapon system evaluation. This data base will include densities, detectability and patterns.
- Show the capabilities of low density scatterable minefields.
- Develop values for the enhancement of direct fire weapons due to the presence of mines.

Dr. Martin Levy is currently Chief of the Operations Research Section of the Concepts and Studies Division, DC/CTD, USAES, Fort Belvoir, Virginia. His undergraduate degree is from Sacramento State College. He has graduate degrees from the State University of California and the University of Maryland. Dr. Levy has taught at Sacramento State College, Case-Western Reserve and American University. He has been involved with simulations of various kinds with the Department of the Navy, NASA, US Army Strategy and Tactics Analysis Group, US Army Institute of Land Combat, US Army System Analysis Group and the Engineer School.

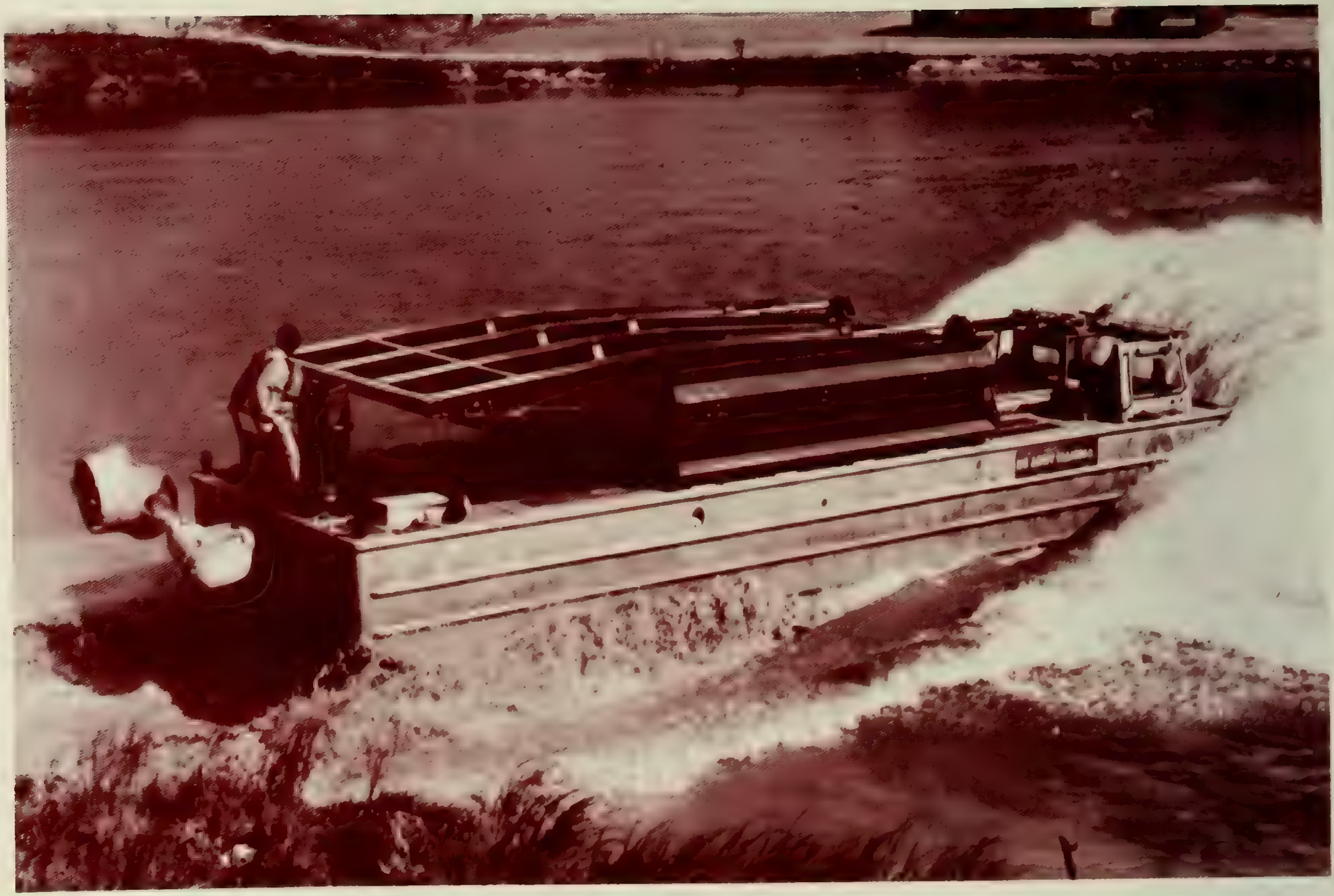
The New Bridges -- Where Are They?

Harold A. Dotterer

The last four years have seen more accomplished toward improving our tactical bridging capabilities than during any other period since WW II. The payoff, in terms of new equipment in the field, should reach its peak during the next six to nine months. Following is a rundown of bridging equipment to look for:

The Mobile Floating Assault Bridge (*MAB*) is not new. It has been in the field in limited quantities since 1968. However, the MAB has been improved and many of the new welded hull models have been bought so that by July of this year three times as many MABs will be in the field. They will be more common in Europe than anywhere else but some CONUS units, particularly Armor and Mech Infantry divisional engineer battalions, will be reequipped with this modern float bridge that can be assembled as a bridge or ferry at the rate of approximately twenty feet per minute.

The Ribbon Bridge is new. It is a bridge system consisting of interior and ramp bays that are transported, launched and retrieved by a modified 5-ton bridge truck. Bays, carried in folded position, automatically open upon entering the water. Then, with the aid of bridge erection boats, they are joined together to form bridges or ferries at rates of 10 or more feet per minute. Made of aluminum alloy, the bridge can support 60-ton loads in currents up to 8 feet per second and 80 tons when conditions are ideal. The system also includes boat launching cradles which enable us to transport and launch an assembled 27 foot bridge erection boat in about three minutes from the same modified 5-ton bridge truck. The system was developed by the Mobility Equipment Research and Development Command (MERADCOM) and in June 1972 was officially designated the standard float bridge to replace the M4T6 and Class 60 float bridges now in the field. The initial production contract with Consolidated Diesel-Electric has now produced sufficient units to start equipping the units in the field. The first units went to the



US Army Engineer School at Fort Belvoir; the US Army Training Center, Engineer at Fort Leonard Wood; and the 2d Engineer Battalion, Korea, in February 1976. Subsequent shipments are destined for Europe, CONUS, and wherever float bridge units are located that have not been reequipped with the MAB.

Soon after we had developed the Ribbon Bridge, engineer field commanders advised the combat and materiel developers of need to retain most of the cargo hauling capability that we now have with the 5-ton stake trucks organic to conventional float bridge units. Since the Ribbon Bridge transporter, by itself, has virtually no cargo hauling capability, a cargo pallet was developed which can transform the transporter into a flat bed cargo hauling vehicle. *The Ribbon Bridge Transporter Cargo Pallet* permits the modified 5-ton bridge truck to carry up to its rated load of general cargo. After off-loading the bridge bay, the transporter launching and retrieving mechanism is used to load an empty pallet, or one loaded with up to 8,500 lbs of cargo. These pallets will be issued as operational project stock to those theater commanders whose plans require that their float bridge companies have a secondary mission to haul general cargo. Initial production quantities of the pallet will be available along with the first increment of the bridge system destined for Europe.

There is still more to be done to meet the short range objectives for improving our bridging capabilities. For example, MERADCOM is working against a DA approved requirement to provide a new bridge erection boat that will be fully compatible with the Ribbon Bridge. This *Ribbon Bridge Erection Boat* will have essentially the same power (thrust) as our current two-piece, 27 foot boat, but its draft will be reduced to about 25 inches. The new boat will have a one-piece hull that will fit onto the Ribbon Bridge transporter which will carry the boat to the edge of the stream and launch it in two to three minutes. The current development schedule calls for the first of these boats to arrive in the field before the end of FY 78.

Another example of things soon to come is the United Kingdom's *Medium Girder Bridge* (*MGB*). After testing this bridge in the US, it was adopted in February 1973 as standard US equipment to take its place along with the Bailey Bridge to satisfy our dry support bridge requirements. The MGB will enable one platoon from the bridge company to erect a Class 60 bridge, 100 feet in length, in approximately one and one-half hours. No assistance will be required from a combat engineer company as is the case with the Bailey Bridge. A contract for the initial production quantity has been awarded to Fairey Engineering, Limited, and the first units should be in the field before the end of FY 77.

Two other developments related to the MGB are also in progress. They are the US developed *MGB Cable Reinforcement Set* and the standard UK *MGB Pier and Span Junction Sets.* Each is a candidate for selection as the US standard method of extending the MGB Class 60 capability from 100 to 160 feet. After they have both been tested, the most cost effective method will be selected and fielded. The Span Junction Set deserves additional consideration because it would provide a capability for erecting multiple span MGBs over existing or expedient piers. Testing is now in progress.

Even as development of these bridge programs near completion and new equipment is being fielded, the R&D community has started working to meet the more stringent demands projected for bridges in 1985 and beyond.

Never to our knowledge has there been a better foundation for starting an advanced development program than has been established for future bridging development. This foundation was laid by an International Concepts Study Team (ICST) whose members included representatives from the Federal Republic of Germany, the United Kingdom, and the United States. The ICST spent 2½ years in a dedicated effort to develop a concept worthy of the R&D effort required to transform the concept into hardware.

Briefly, the concept depicts a family of bridges with a maximum commonalty of major components which can be mechanically launched by a small crew. This family of crew launched bridges would be employed in all tactical bridge roles, i.e. assault, dry support, and wet support.

Currently MERADCOM is engaged in the engineering effort required to thoroughly evaluate the concept while a joint USAES/MERADCOM draft of the Letter of Agreement for the "Investigation of a System of Bridges for 1985 and Beyond" is moving up the chain to DA for approval.

Mr. Dotterer is a Combat Development Materiel Analyst with the Materiel Systems Division, Deputy Commandant for Combat and Training Developments, US Army Engineer School (USAES). Associated with the Corps of Engineers since 1943, his previous assignments have included duties as Combat Engineer Platoon Sergeant during WW II, Engineer Commander in Korea, Theater Map Distribution Officer in USAREUR, Instructor Engineer Officers Career Course, USAES, Staff Officer (S4),1st Engineer Combat Battalion, and Project Officer in the Doctrine Division, Office of Doctrine and Training Developments, USAES.

CCE: Update

Engineer Staff

The M870 40T semi-trailer in combination with the M123 10T tractor will carry the D8K dozer without overloading either the tractor or the semi-trailer if the D8K is loaded with the blade resting on the gooseneck and with 8 to 12 inches clearance between the front of the track and the gooseneck.

An analysis by the US Army Mobility Equipment Research and Development Center indicates that this method of loading puts a load of 59,000 to 60,000 pounds on the trailer rear axle group and 38,600 to 39,600 pounds on the M123 king pin.

These axle loads are in excess of some states' legal limits. For the proposed long term solution to this problem see the CCE update.

Commercial Construction Equipment (CCE) continues to make its way to the field at an ever-increasing pace.

In November of 1975, the new utility tractor with backhoe and loader (John Deere Model JD-410) began arriving in engineer units. The utility tractor provides a much needed, versatile capability for performing excavating, entrenching and back filling operations.

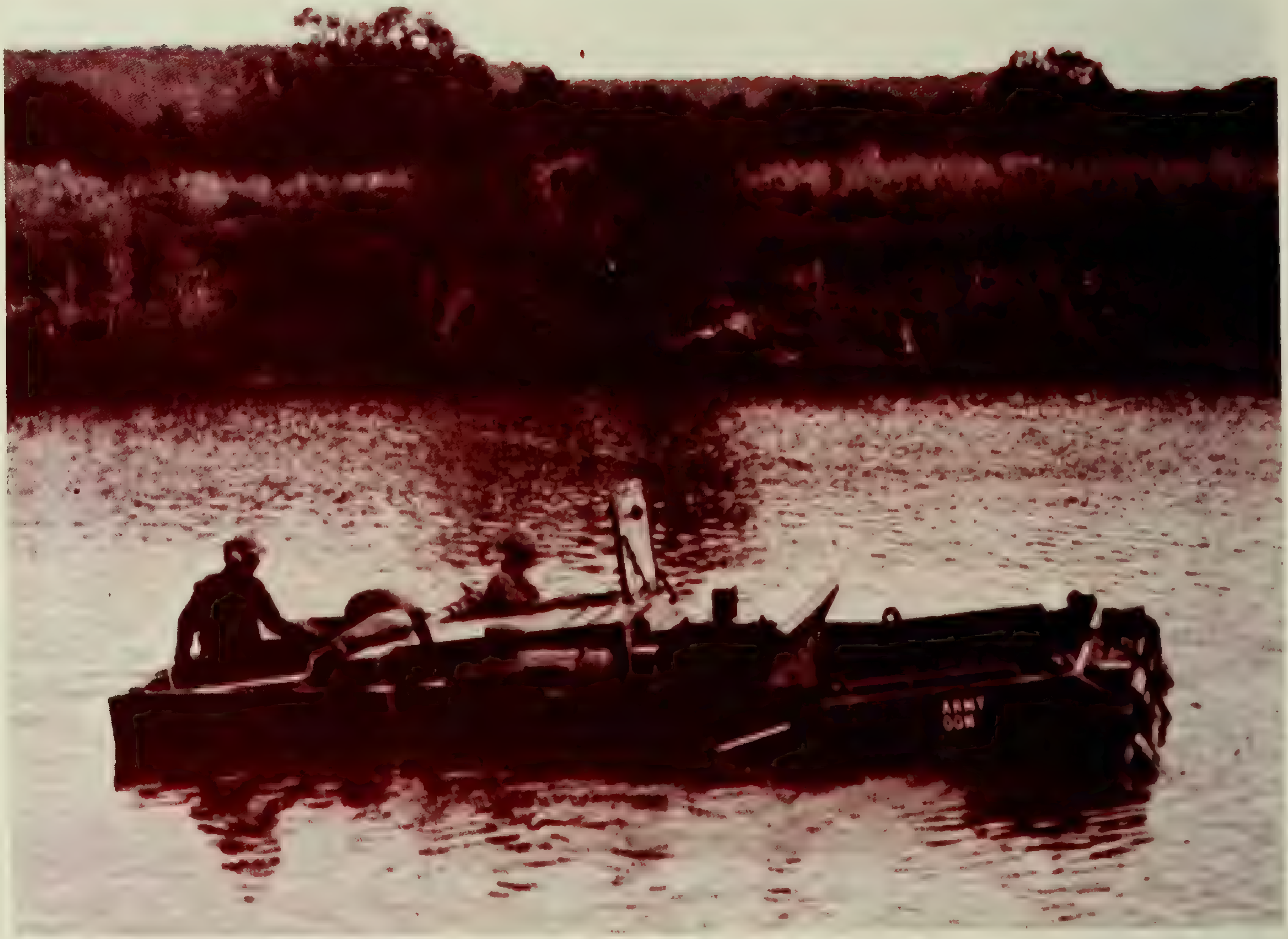
Two new items of compaction equipment are being introduced in the last half of FY 76. Shipment of the new high-speed tamping foot compactor (Koehring Model K-330) began in January, and the new self-propelled vibratory roller (Tampo Model RS-28) is scheduled to begin arriving in the field in June. Also in the compaction area, the gasoline-engine driven hand tamper (Stone Model VR-11) will make its debut in July. With the introduction of a new self-propelled pneumatic roller later in the year, the entire Army fleet of compaction equipment will complete a much-needed upgrading.

In a related area that should spark considerable interest among the maintenance and logistics types, specifications are currently being written to procure a common Engineer Truck Chassis for the 20 ton dump truck, the new 8 cubic yard concrete mobile and the prime mover for the CCE 40 ton semi-trailer. Higher densities in individual units and greater commonality of major components are the goals for this program.

Finally, in early February a coordination conference was held to complete agreement on the specifications for a 750 CFM air compressor that will replace the current 600 CFM used in rock drilling operations.

More items are scheduled for contracting in FY 77 and we'll keep you posted on what happens as events evolve.

Evaluation for the UET



IT EVEN SWIMS — This universal engineer tractor (UET) recently underwent testing and evaluation by Headquarters, MASSTER (Modern Army Selected Systems Test, Evaluation and Review). In addition to its swimming capability, the UET can also travel cross country. The UET could in the future provide the combat engineer with the mobility required to keep pace with armored and mechanized units on the move.

SP4 Linda St. Pierre

Often during the conduct of war, maneuver units encounter natural and man-made barriers which may delay their advance and expose them to intense enemy bombardment. Removing such barriers is the responsibility of combat engineers who must be readily available to accomplish their mission to enable the infantry and armor to regain the momentum of the attack.

Within the engineer community, there is a requirement for multi-purpose equipment to provide the degree of mobility required to keep pace with fast moving armor, mechanized infantry and airborne thrusts.

In order to help satisfy this requirement, user tests were recently conducted at Fort Hood. Headquarters, MASSTER (Modern Army Selected Systems Test, Evaluation and Review) evaluated a Universal Engineer Tractor (UET) as a possible answer to the necessity of responsive support for the maneuver arms.

The user evaluation test was designed to obtain information as to the operational feasibility, user acceptance and potential operational advantages of the UET. Objectives of the test were to evaluate the utility of the UET, provide information of the ability of the UET to perform assigned tasks in an operational environment and to obtain data as to the reliability, availability, maintainability and performance characteristics of the UET. During the test period of October 6 to December 12, the opinions of operators, supervisors and battalion officers were solicited and evaluated.

MASSTER evaluated two of the four existing UET s while one was undergoing tests by Test and Evaluation Command (TECOM) at Aberdeen Proving Grounds, Maryland, and the fourth remained with the contractor.

Primarily the UET is a bulldozer and scraper but has other capabilities. It can be used as a prime mover, rough grader, cargo carrier and dumper.

The 32,000-pound UET can reach a top speed of 30 miles per hour and can carry up to eight cubic yards of material. When employed in the transport mode, the UET can carry over 200 cubic feet of cargo, and is capable of self-loading palletized loads.

Somewhat similar in shape to the armored personnel carrier (APC) the UET is eight feet high, nine feet wide and 24 feet long, four feet longer than the APC. The UET is lighter than the D7F dozer which weighs approximately 48,000 pounds. The scraper bowl of the UET can be ballasted with soil to increase the UET gross vehicle weight to 54,000 pounds.

In moving, the UET uses a steering wheel system rather than the usual levers employed on other tracked vehicles.

The biggest advantage the UET has over current earth movers is its capability of traveling over rough terrain. With this cross-country capability, the UET enables the combat engineers to keep up with armored and mechanized troops.

The UET also has a limited swimming capability comparable to the APC and utilizes a bilge pump system like that of the APC to discharge the water taken on through unsealed metal junctions.

From the data collected during the test period, operators of the UET seemed to like the added mobility of the UET and the additional capabilities that the UET has, such as swimming.

The 8th Engineer Battalion, 1st Cavalry Division used the UET during the month of October for building barricades, tank traps, digging APC emplacements and constructing a rough pioneer road. The 17th Engineer Battalion, 2nd Armored Division used the UET during November to perform range maintenance on roads and to work on enlarging the division's high-pressure wash racks.

The original concept of the UET was first formulated in 1958 when the Mobility Equipment Research and Development Center (MERDC), Ft. Belvoir, Virginia, initiated development effort for a universal tractor. The initial concept was for a rubber-tired, ballastable airborne tractor to fulfill the needs of airborne engineer units. Industry was asked to submit proposals for such a tractor, and an alternate proposal for a ballastable, scraper-dozer tractor was accepted by the developer. Approval of military characteristics for a UET was obtained in 1960. The basic requirement for the UET was under constant revision until 1965.

Since late 1964, the UET underwent extensive engineering and service testing by TECOM. These tests indicated that the UET failed to meet reliability, durability and maintenance requirements but did perform its earthmoving and hauling functions in an outstanding manner. The present development program consists of an Advanced Production Engineering contract to improve these tractor components which failed and the fabrication of four UETs for government evaluation. The four UETs which were developed underwent contractor testing during the past summer, and MASSTER was tasked by the Army Material Command to test two of the UETs.

Use of the UET by the combat engineer in the future would not only provide him with equipment with various capabilities, but would allow the combat engineer to keep up with mechanized and armored units on the move. The UET's mobility, especially to travel over rough terrain, will enable the combat engineer to remain with the maneuver units.

Specialist Fourth Class Linda St. Pierre is an information specialist at Headquarters, MASTER, Ft. Hood, Texas

MAJ Joel M. Cain

Ask a group of U.S. Army Corps of Engineers officers where topographic engineers receive their training and watch their reaction. After a few moments, most would say the Mapping, Charting and Geodesy Officer's Course at Ft. Belvoir, Virginia. The more senior officers would say through a civilian graduate program, and perhaps one in a hundred would mention the School of Military Survey in England. The Army Survey Course at the School of Military Survey is a professional development advanced course for Royal Engineers Officers who have been selected for the Royal Engineer Survey Service. The School is under the technical direction of the Director of Military Survey and organized into Departments of Field Survey, Air Survey, and Cartography with each department headed by a chief instructor. An interesting approach to teaching is used; rather than teach a number of subjects concurrently, a single subject is mastered at a time. The student is taught by the same instructor for periods of two to nine weeks.

Candidates for the course are carefully selected. A maximum of 18 students can be accepted for each course. Officers of the Royal Engineers, probationers of the Directorate of Overseas Surveys, and officers and civilians of Commonwealth and foreign military (including the U.S.A.) are eligible.

The methods of instruction are lectures and tutorials consolidated by practical exercises. Many of the practical exercises provide continuity between subject areas; for example, positions defined in the field surveying are used to control air survey projects. The course is divided into Basic and Advanced parts. At the end of the Basic part, a practical task (trial survey) is used to consolidate in the field all techniques learned in the previous eight months. The trial survey is a one-month individual task, resulting in each student producing an original large scale (1:2,500) survey and a drawn contoured map of the survey site. Tests are given throughout the course to ıssess the student's progress and as instructional ools. Although graded, these tests are considered ourse work and not examinations. Written comprehensive examinations are taken after the Basic nd Advanced parts of the course and consist of even three-hour papers. To pass the course, the student must successfully pass every test with a minimum score of 40 and an overall average of 50. Professional qualifications and credentials may be btained by successfully completing the course. A pass in Parts I and II of the course exempts students from the Royal Institute of Chartered Surveyors professional written examination. The duration of the course is 53 weeks, with two courses running concurrently, one starting in the spring and the other in the fall. Subjects covered in the course are:

Subject	**Approx. Duration**
Basic field surveying	9 weeks
Basic field astronomy	3 weeks
Field observations for major control	2½ weeks
Cadastial surveys, land registration large-scale topographic surveying techniques	7 weeks
Basic air survey	4 weeks
Cartography and map reproduction	5 weeks
Trial survey	5 weeks
Advanced survey	7 weeks
Advanced air survey	5 weeks
Leave and holidays	4½ weeks
Examinations	1 week
	53 weeks

The School is not all academics. There is also extensive social activity. The students are provided quarters and are integrated into the British military and civilian community. The small classes are ideal for developing deep and lasting friendships between students. The large percentage of allies creates an international environment where numerous customs, traditions and attitudes are assimilated. Organized social functions include monthly Dining-Ins, the Survey Summer Ball, and the Engineer Ball. Foreign students also have the opportunity, as exchange officers, to participate in their own Embassy functions.

Seventeen U.S. Army Corps of Engineers officers have attended the Army Survey Course since 1961. The course provides officers with the "hands on" experience that is not provided in our civilian Advanced Degree Programs. Since 1970, graduates of S.M.S. have combined the Army Survey Course with a consecutive assignment to graduate school. They are given up to 9 credit hours for the course at S.M.S. and may be able to qualify for a Master of Science Degree in geodesy or photogrammetry with as little as one additional year of advanced training.

Officers interested in taking the Army Survey Course can apply to the Engineer Branch, MILPERCEN. In addition, short courses are offered for U.S. personnel in land navigation and astronomic position fixing. These courses have been primarily attended by Special Forces Units, but engineer units stationed in Europe can inquire as to availability of these courses by writing to Directorate of Military Survey, Ministry of Defense.

A graduate of the British School of Military Survey, MAJ Cain started his career in the U.S. Air Force before transferring to the Army Corps of Engineers. After receiving a Bachelor of Science degree in Geodetic Science from Ohio State University, his first assignment upon commissioning was to Detachment 3, 1381st Geodetic Survey Squadron, Grand Forks A.F.B., North Dakota, where he served as Operations Officer and Detachment Commander. His Army assignments have included: the Engineer Officer Basic Course; Airborne training; S-1, 326th Engineer Battalion; Commander, 66th Engineer Company (TOPO) (CORPS) in Viet Nam, and attendance to the Army Survey Course. MAJ Cain received his Masters Degree in Geodesy and Photogrammetry at Iowa State University. He was an Exchange Officer with the Mapping and Charting Establishment (Royal Engineers) prior to attending the Engineer Officers Advanced Course in 1973-1974. CPT Cain is currently an instructor at the Military Intelligence School, Ft. Huachuca, Arizona.

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SUMMER 1976 TURBULENCE IN OPD

There will be a major turnover in the near future of the Engineer officers currently assigned to OPD. An asterisk appears beside the name of those officers who are departing. The replacement, if known, is indicated in parenthesis.

Colonels Division: (DAPC-OPC-AE)
Engineer Assignments, LTC Tom Sands, 325-7871

LTC Division: (DAPC-OPL-AS)
Engineer Assignments, LTC Henry Covington, 325-0423

Majors Division: (DAPC-OPM-AS)
*Engineer Assignments, MAJ Ted G. Stroup, 325-8109
(MAJ Gary E. Woodham)

Combat Support Arms Division:	(DAPC-OPF-E)	
*Division Chief	COL Carl P. Rodolph	325-0628
*Engineer Branch Chief	LTC Charles E. Eastburn (LTC Norman Kuklinski)	325-7434
CPT Assignments	MAJ James E. Corbin	325-0650
*LT Assignments	CPT Milton Hunter (CPT Michael R. Foster)	325-0651
*Professional Development	MAJ Martin Suydam	325-7426
*Personnel Actions	LTC Leslie H. Savage (MAJ Roger Yankoupe)	325-0621

Warrant Officers Officers Divisions:	(DAPC-OPW-AU)	
Engineer Assignments	CW4 Jean L. Derby	325-7837

Professional Development Division:	(DAPC-OPP-P)	
*Engineer Specialty Monitor	LTC Edward Rapp (MAJ Tom Ostenberg)	325-8152
*Chief, Plans Branch	LTC Edward Rapp (MAJ Galen Yanagihara)	325-8152

TOPOGRAPHIC ENGINEERING

The following chart displays a breakdown by grade of Army Engineer Topographic officers from colonel through warrant officer. The officer assets include those who have received graduate training in a Topographic discipline and those officers who have received other training by serving in Topographic positions and in some cases, attending other Topographic schools. The requirements figures are developed from the most recent data available.

Army Topographic Officer/Assets

Type of Training	COL	LTC	MAJ	CPT	LT	W
Graduate Training	6	35	30	10	1	
Other Training	17	38	22	65	25	3
Total	23	73	52	75	26	3
Requirements	9	27	21	26	18	3
Asset/Requirements (A/R)	2.5	2.7	2.4	2.9	2.0	2.

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The A/R ratio of 2.4 to 1 and greater for field grade officers is sufficient to meet normal requirements. Company grade officer positions are normally filled by personnel serving their first or second tour in the Topo field.

The following table reflects our Topographic Training forecast (fully funded civil schooling in support of Topographic AERB positions).

Topographic Training Forecast (Graduate Schooling)

Discipline	Initial AERB Positions	School Input	FY 74	FY 75	FY 76	FY 77
Geodetic Science	8	5	3		1	3
Topography & Photogrammetry	4	2	2		1	1
Geological Science	2	0	1		0	0
Geography	1	0	0		0	0
Totals	15	7	6		2	4

AVIATION AS AN ALTERNATE SPECIALTY

As a result of recommendations made in a detailed ODCSPER study of the Army's Aviation Management System, the addition of aviation to the list of specialties under OPMS has been approved.

The new aviation specialty concept is keyed to meeting field grade aviator requirements. Its main features include the following:

Aviation is an advanced entry specialty to be designated in an officer's eighth year of service.

Aviators will be trained and assigned based upon their basic entry specialty.

In the future, only officers from Infantry, Armor, Field Artillery, Air Defense Artillery, Engineer, Signal Corps, Transportation Corps, and Military Intelligence branches may receive flight training.

Officers enter flight school between completion of their BR OBC and one year of troop duty and their 60th month of commissioned service, except for those in the Aviation Materiel Management specialty who will attend upon completion of the Transportation Officer Basic Course.

One of the primary concerns in developing the Aviation specialty is to insure that it is supportive of the present role of Army Aviation. The Army Aviation Program must continue to attract motivated, highly qualified officers who are well grounded in the combat and combat support arms. These officers must be provided with a career experience that will allow them to make a professional contribution in command and staff assignments at every level of the Army. Therefore, these criteria will apply to selecting officers for the Aviation specialty:

Army requirements.

Manner of performance in aviation command and staff positions.

Potential for future development in aviation assignments.

Year Group strength requirements.

Utilization standards (Aviation Career Incentive Act).

The designation plans closely parallel those with a YG prior to 69 used to designate all other OPMS specialties. Once the records of all aviators have been reviewed based on known Army requirements and the officer's experience to date, OPD's career divisions will determine the OPMS specialty combination tentatively considered most appropriate for future designation. During March 1976, each aviator will be apprised by letter of these tentative designations and will be asked to cite a preference for other appropriate designations. All factors will be considered by a board of officers to determine final designations. By 30 June 1976, commissioned aviators will be informed of the two specialties in which the board decides they should expect future management.

Once redesignated into the aviation specialty, officers will be managed primarily in aviation and

ENGINEER

one other OPMS specialty. Those officers not selected by the board for redesignation will continue to be managed in their currently identified specialties.

All aviators — including those involuntarily precluded from having aviation as one of their OPMS specialties — will be entitled to continuous incentive flight pay for the first 12 years of aviation service provided they maintain Class 2 physical standards and complete the annual written examination. Although commissioned aviators cannot be guaranteed of making the Aviation Career Incentive Act pay gates, and thus receiving monthly flight pay beyond their twelfth year of aviation service, those redesignated into the aviation specialty will have the greatest opportunity to meet the gates, since they will receive intensive management into positions requiring qualified commissioned aviators.

STABILIZATION

The Officer Corps currently is enjoying the greatest amount of stability on station since the post Vietnam environment. Decreased "non-dependent tours (NDT)" requirements, escalating moving costs, lack of PCS funds, etc., all have impacted to provide more time on station for military personnel and dependents. Current DA Conus stability policy is 36 months on station. Exceptions to this are primarily in the schooling area — both, military and civil. Overseas tours remain at 39 months for accompanied long tours and 13 months for non-dependent tours.

HOMEBASING/SEQUENTIAL ASSIGNMENT

Effective 15 January 1976, OPD began implementation of a Sequential Assignment Policy for all officers selected for 12/13 month NDT. This policy requires that all officers being considered for a NDT be informed of their sequential (follow-up) assignment prior to their departure for overseas. This DOD policy was developed to reduce PCS expenditures associated with the displacement of family dependents concurrent with a PCS to and from a NDT area. Hopefully, the family would elect to remain at their current location or to proceed in advance of the officer to the vicinity of his new duty station, thereby saving one dependent PCS relocation cost. As a separate but related issue, the ODCSPER is exploring the feasibility of the officer's family occupying government quarters during his absence, either at the losing or the gaining installation. Implementation of this policy is requiring an extraordinary amount of coordination, however, it will be several months before we will be able to assess its impact. An individual being placed against a NDT requirement can elect not to participate in this DOD program.

MAJORS ASSIGNMENTS

Although Major nondependent tours are somewhat limited, overseas vulnerability currently is defined as those officers who have two or less NDTs and have been stationed in CONUS since 1968-69. Vulnerability for accompanied overseas tours will go to those having 36 months or more in CONUS.

It has become increasingly important that Majors think of qualification in their alternate specialties. They should look at this in terms of duty assignments, military schooling, and civil schooling.

The field can expect to see arriving on the scene other officers from different primary specialties beginning to serve in their alternate specialty of 21.

With the new CGSC selection procedures, i.e., DA Board, it would appear that we did well with the number of 04s selected. However, this is an aberration since we had so many last year eligible (LYE).

The CGSC military education level continues to be important for assignment actions. We continue to recommend non-resident CGSC for those officers in their waning years of eligibility who have not attended the Resident Course.

Majors should seriously consider changing jobs at least once during a normal 36 month tour to

POTPOURRI

demonstrate their versatility. PCS constraints prevent the frequent movement of personnel strictly for professional development.

CAPTAINS ASSIGNMENTS

Overseas: Long tour assignments are available in decreasing frequency to: USAREUR, Hawaii, Alaska, Canal Zone, Middle East, Mediterranean and the Far East. Most overseas requirements will be filled by volunteers. Officers having no nondependent tours or those who have had only one NDT and who have been in CONUS for 4 to 5 years are vulnerable for another NDT.

CONUS: Captains eligible for CONUS assignments are reviewed for assignment approximately 5-6 months in advance of the required reporting dates. Currently, Captains can expect to serve 36 months on station in CONUS, excluding schooling assignments. USAREUR tours are now at 39 months.

Assignments will be available in OCE activities, Facilities Engineering, and AMC for qualified officers. Those officers completing graduate level civil schooling can anticipate an OCE, TOE/TDA staff, Facilities Engineering, ROTC, or Service School utilization assignment.

EOAC: Engineer Officers Advance Course (EOAC) will be programmed into an officer's assignment pattern as a normal PCS move. Captains and Lieutenants in long tour areas or CONUS may be curtailed up to 6 months for EOAC. Those qualified Captains who have not been to EOAC will be selected for attendance upon completion of 36 months on station contingent upon individual desires and current eligibility criteria. Since EOAC has been reoriented to prepare company grade officers for command, Engineer officers can expect to attend the Advanced Course between 3-6 commissioned years of service. Fort Belvoir conducts three courses of 26 weeks duration per year. Officers who are interested in attending either the Infantry or Armor Officer Advanced Course should make their interest known to their assignment officer.

LIEUTENANT ASSIGNMENTS

Assignment stability dictates CONUS tours of 36 months on station prior to consideration of a PCS. Overseas tours range from short tours of 13 months to long tours of 39 months.

EOAC (Engineer Officer Advanced Course) is generally the next step after initial CONUS or Oversea (long) tour. Eligibility criteria remains the same: Good performance with troops and availability. Selections are made on a competitive basis. Attendees, to-date, have been in the primary zone-of-consideration for promotion to Captain, AUS.

WARRANT OFFICER ASSIGNMENTS

Procurement is still open for Engineer Equipment Repair Technicians. Twenty-four appointments have been made this FY with Approximately twenty-five more authorized. Authorized FY 76 end strength is projected to be 255.

The Managed Tenure Program replaced Long Range Active Duty for retention of other than RA Warrant Officers with over 20 years active federal service. The DA Active Duty Board recently considered for retention those Warrant Officers with retirement eligibility in FY 7-T, 77, 78. Selections by MOS are as follows:

351A-1
521A-5
621A-23
811A-0
821A-0
833A-0

Integration into the Regular Army is the only alternative to Managed Tenure for Warrant Officers desiring a career longer than twenty years. There are limited vacancies in MOS 351A, 811A, 821A and 831A, however, multiple vacancies exist in MOS 521A and 621A. Engineer commanders are requested to encourage and assist applicants for integration. References are AR 601-100 and DA Circular 601-62.

BRIDGING

STATUS OF ARMY ENLISTED CIVIL EDUCATION PROGRAM

Fully Funded Enlisted Education Program

Recent congressional action has eliminated budget appropriations to support the FY 76 Fully Funded Enlisted Education Program, which allowed selected individuals to receive up to two years of civil college education at government expense. As a result, new enrollments in the program have terminated; all pending applications on file at MILPERCEN's Enlisted Personnel Directorate are being returned.

Fellowships, Scholarships, Grants

The Fellowship, Scholarship or Grant Program—which authorizes qualified individuals to compete for educational programs offered by corporations, foundations, funds or educational institutions—is still available to eligible enlisted personnel. This program provides outstanding soldiers an opportunity to study for periods up to two years in disciplines which will satisfy Army skill requirements. These disciplines will be announced at a later date. It is expected that the skills required will be mainly in the scientific and engineering fields. See AR 621-7 for details.

Tuition Assistance Programs

Soldiers are encouraged to contact their local education advisor for information on other programs available for the continuation of their off-duty educational pursuits under the General Education Development Program (See AR 621-5). Tuition assistance allows for appropriated funds to be used to pay 75 percent of tuition costs, or fees in lieu of tuition costs, for Army personnel attending off-duty classes conducted by regionally or nationally accredited civilian education institutions.

Bootstrap

The Army plans to request congressional permission to reestablish initial soldier participation under the Enlisted Undergraduate Degree Completion Program (Bootstrap), which was terminated in October 1974. Major commanders will be notified if and when the program is reinstated.

REMINDER FOR OCS PREDEPARTURE INTERVIEWS

MILPERCEN and the Training and Doctrine Command (TRADOC) are again reminding unit commanders, Military Personnel Offices (MILPOs), and individual soldiers of the requirement for Officer Candidate School (OCS) Predeparture Interviews.

The interview, required within the last two weeks before a soldier departs for training, is designed to insure that individuals are still as qualified to attend OCS as they were at the time of their selection. The interview places special emphasis on motivation as well as physical, personal, and financial qualifications. Despite this, many soldiers still are not receiving their final interviews and are found to be unqualified when they arrive for training and must be cancelled from the class and returned to their units. These last-minute nonenrollees hold quotas that could have been filled by stand-by personnel who remained qualified.

MILPOs are reminded not only to insure the proper filing of the narrative summary of the interviews, but also to conduct a verification to insure that selectees possess the necessary qualifying test scores that are normally posted in the candidates' records.

Individuals involved in the OCS application chain may obtain detailed guidance for processing OCS applications and Predeparture Interviews by referring to AR 351-5, "Army Officer Candidate Schools."

THE GAP

ENLISTMENT BONUS PROGRAM CHANGES

The Army's Military Personnel Center has announced that effective 1 June 1976, only those individuals who are within mental categories I-III and possess High School diplomas may enlist for six MOSs within CMFs 11 and 13 and be eligible to receive Enlistment Bonuses (EBs).

By 1 June, the phased reduction will limit the MOSs for which enlistees may receive EBs of $1500 to 11B, 11C, 11D, 11E, 13B, and 13E.

As exceptions to the new policy, individuals who enlisted into the Delayed Entry Program (DEP) before 12 January 1976 and who are scheduled to enter active duty after the implementation of the reduction program will be eligible to receive the bonus based on the criteria in effect at the time of their entry into the DEP.

More information and detailed implementing instructions for the new policy are contained in the MILPERCEN message 121510Z Jan 76, "Enlistment Bonus Program Changes."

AIRBORNE AND SPECIAL FORCES VACANCIES

The Army's Military Personnel Center has projected Special Forces and Airborne vacancies in 420 MOSs at various grade levels for Fiscal Year 1977.

Interested personnel not serving in stabilized assignments as a result of enlistment options for particular units or installations may submit applications for Airborne or Special Forces duty in accordance with AR 614-200. Soldiers in stabilized assignments also may apply provided waivers of commitment are forwarded with their applications. Those who previously initiated requests to terminate Airborne duty are not eligible to apply unless the termination was for hardship or compassionate reasons.

Application for Airborne vacancies will be processed under Chapter 10 of AR 614-200 and must include:

- either the date of Airborne qualification or a statement of willingness to attend Airborne training;
- the soldier's current grade;
- the MOS vacancy for which the soldier is applying, which may be at the soldier's current or next higher grade;
- a statement as to whether he is entitled to dependent travel and movement of household goods at government expense;
- date of last PCS move and whether the move was from overseas or within CONUS; and
- a statement that he meets the selection criteria outlined in AR 614-200.

Applications for Special Forces vacancies must include the same information required for Airborne duty as well as a statement of the soldier's linguistic ability. Special Forces applications are governed by Chapter 12 of AR 614-200.

A detailed listing of the 420 MOSs having vacancies by grade level and further guidance concerning the program may be found in the two-part MILPERCEN message 041500Z December 1975.

ENLISTED DA FORM 2-1 REPRODUCTION REQUIREMENT EASED

The requirement for Military Personnel Offices (MILPO) to submit copies of E6-E9 Personnel Qualification Records, DA Form 2-1, to the Enlisted Records and Evaluation Center after the soldier's annual records review has been discontinued, according to MILPERCEN.

The requirement, initiated in October 1973, also specified that a copy of page 1 of the form must be reproduced when the soldier was considered by a promotion selection board if there had been a change in certain items since the last annual records review.

The elimination of the requirement is a part of MILPERCEN's effort to reduce the workload at the MILPO and to save both manhours and material. Now, MILPOs will only be required to furnish copies of the form on an as-need basis, such as for future promotion selection board processes.

Happy Birthday
Army—201 Years

Happy Birthday
America
-200 Years

Happy
Birthday
Engineer
Magazine
-5 Years

We Make
a Great Team

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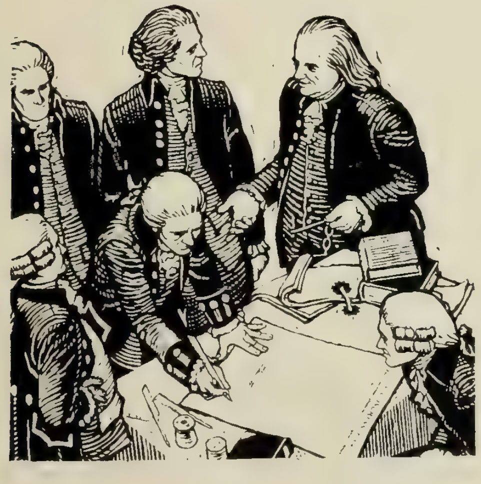

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THE ENGINEER

VOLUME 6 NUMBER 2 APR MAY JUN 1976

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CHIEF'S BRIEFS

Brevet Major General John Newton was born in Norfolk, Virginia, ugust 24, 1823. He was graduated from the United States Military cademy on July 1, 1842 and promoted Second Lieutenant, Corps of ngineers.

Newton was Assistant Professor of Engineering at the Academy rom 1843 to 1846. He supervised the construction of fortifications long the Atlantic Coast and Great Lakes from 1846 to 1852 and served s a member of special coastal defense boards from 1855 to 1860.

Although a Virginian, Newton did not follow Lee in joining the onfederacy, but remained loyal to the Union. From 1861 to 1862, he elped construct the defenses of Washington, D.C. and led a brigade at ntietam. As a division commander, he stormed Marye Heights at redericksburg. Newton led the 1st Army Corps to break Pickett's harge at Gettysburg and commanded a fighting division during herman's Atlanta Campaign in 1864.

After the war, Newton supervised the defenses of New York arbor and served on many Engineer boards until his appointment as hief of Engineers in 1884.

Upon retirement in 1886, Newton became Commissioner of Public orks, New York City, and became President of the Panama Railroad ompany in 1888.

General Newton died May 1, 1895 in New York.

Edward B. Russell
Curator, US Army Engineer Museum

United States Army
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Fort Belvoir, Virginia

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ABOUT OUR COVER

America has celebrated another Birthday. This one was special because it marked 200 years of independence. Just 200 short years ago the United States of America was 13 small fledgling states, each struggling almost independently for its survival. Now the U.S. has grown to become the strongest industrial nation on earth. A remarkable story of success to say the least.

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.PIPELINE. PIPE

CCE UPDATE

The major activity in the CCE area involved the various commercial trucks destined for Engineer Units. A specification has been prepared describing the Transportation Corps Line Haul Truck Tractor (XM915), the Engineer Truck Tractor (XM916) and two configurations of truck chassis to be used to carry the Concrete Mobile, 20 Ton Dump and Bituminous Distributor bodies. It is anticipated that repair parts for the four Engineer vehicles will be common.

Major milestone include the award of contracts for the 750 CFM Compressor, the 6000 Gallon Water Distributor, the Nuclear Moisture/Density Tester and the 25 Ton Crawler Crane all in June; and conduct of the Firt Article Demonstration on the High Speed Tamper in May. Fielding of the Tamper is scheduled to commence in June under a revised schedule.

DUAL ROLE FOR NEW CARGO PALLET

A cargo pallet designed to fit the Army's ribbon bridge transporter for a dual role as a general cargo carrier has been developed by the U.S. Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, Va.

The 5-ton transporter equipped with a hydraulic boom is used to carry, launch and retrieve complete bays of the Army's newest floating bridge.

When not performing its bridging mission, it can retrieve and launch the specially-designed 19 x 10-foot pallet loaded with up to five tons of equipment or supplies to double as a cargo hauler. Loaded in place the aluminum flatbed platform can support 10 tons for highway transport.

The second capability to self-load," transport and off-load cargo was added by MERADCOM late in its ribbon bridge transporter development when cutbacks in military vehicles made maximum utilization imperative. R&D pallets were procured, tested, and type classified in a period of only eight months, a fraction of the time normally required to complete the development cycle.

Initial production quantity of 120 pallets will be delivered to the field in summer of 1976.

NEW PIPELINE SYSTEM DEVELOPED BY MERADCOM

An air-transportable tactical mooring and off-loading pipeline system developed by the U.S. Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, Va, permits unloading tankers over undeveloped beaches or where port facilities are unavailable due to battle damage or natural disaster.

Tests have been successful on the system which can moor tankers up to 25,000 deadweight tons (DWT) while bulk fuel is discharged thru pipelines up to 5000 feet long to onshore storage facilities.

The lightweight system including support equipment can be delivered by C-130 transport planes to rough landing zones. It can be installed in 72 hours by an Engineer Port Construction Company of 80 plus 2 radar men.

Each of four mooring legs is comprised of a catamaran connected to a 50,000 pound holding capacity explosive embedment anchor. Machinery aboard the catamarans lower the anchors to the ocean floor where they embed automatically upon contract. The catamarans then serve as mooring buoys for hawsers run from the tanker's stern after the tanker's bow anchors have been dropped.

Support equipment includes two motor surf boats, pulling block assemblies and winches, and mooring site survey equipment which are also air transportable.

After mooring is complete, a submersible six-inch pipeline is installed using a winch, 55 gallon drum buoys and a special floating block also anchored by an explosive embedment anchor.

GENERATOR TESTING COMPLETED BY MERDACOM

Component testing has been completed on a 10 KW gas turbine engine driven generator (GTED) generator set under development by the U.S. Army Mobility Equipment Re-

LINE. PIPELINE.

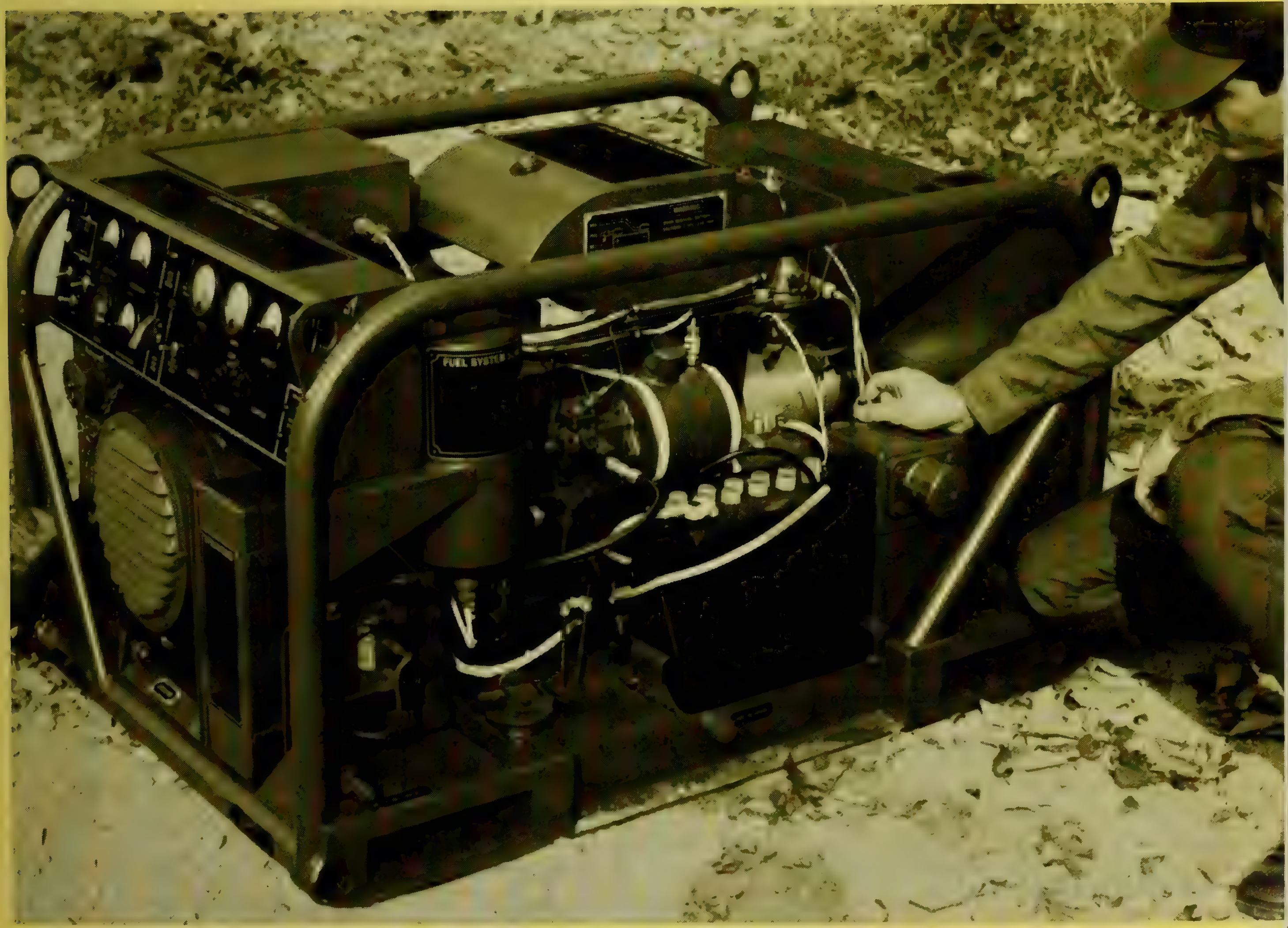
search and Development Command (MERADCOM), Fort Belvoir, VA, as the first in a series of new military electric power units designed to give the Army a higher degree of mobility and reliability supplying power to ground and vehicular support systems.

The successful test ends this phase in the $3.7 million d sign, development and te contract with Solar Division International Harvester Cor pany.

When complete in 1977, the 10 KW set is expected to offer many advantages over the 5 and 10 KW gasoline engine driven generators it is slated to replace.

Compared with the current standard 10 KW engine driven set it is lighter weight: 450-pound package contrasted with 850 pounds for the gasoline engine driven set; more compact: 20 versus 28 cubic feet; and more reliable: 500 to 1200 hours mean time between failures compared with 160 hours, and 6,000 to 10,000 hours between overhaul versus 1500 hours.

In addition, the 10 KW GTED generator set can operate on a variety of fuels, including no-lead gasoline, jet, and diesel fuel, and at temperature extremes of 125 degrees Fahrenheit to minus 65 degrees. Also its operation is vibration-free, low-pollutant, and without external cooling.



Stop 16

SIR:

On your 201st anniversary, your comrades in arms in Korea join me in extending heartiest greetings conjoined with deep respect and admiration for the many accomplishments and dedicated service which have long been the hallmark of the Corps. Throughout our nation's history, the Corps of Engineers has demonstrated unflagging professionalism in the discharge of every task, whatever the circumstance. And it has never been found wanting. The result is a record notable for its brilliance, its scope and its contributions to the attainment of national objectives. The Eighth United States Army salutes your predecessors and you for your collective devotion to duty, superb competence and adherence to the highest standards of the profession of arms. We are confident that you of the Corps will be true to the motto ''Essayons,'' as you welcome every new challenge.

General Richard D. Stilwell
Commander, Eighth Army
APO SF 96301

Sir

Reference the article, ''Anti-Tank Ditch Construction,'' published in the Fall 1975 issue of ''The Engineer.''

The method recommended for construction of anti-tank ditches in paragraph 4 of the referenced article seems to me could result in some disastrous consequences. The article states that the spoil is to be placed along the friendly side of the ditch — that's the problem!

The spoil on the friendly side of the ditch hinders observation by the friendlies of tanks moving up to the ditch. Once the tank is in the ditch, it can use its main armament to push aside the spoil and fire from hull defilade. Thus the engineer has constructed an ideal defensive position for the enemy armor.

It would seem logical to me that the spoil should be placed on the enemy side of a narrower (3-4) and deeper (2 plus m) ditch and the tank taken under fire as he proceeds over the spoil and then is entrapped at a steep angle within the ditch under full observation of friendly weapons with its engine compartment exposed.

But even this technique offers the enemy tank the opportunity to use the spoil as cover for a firing position. Therefore, the logical solution would be leveling the spoil out to no more than 1 to 2 feet in thickness on the enemy side of the narrower and deeper tank trap. With the addition of mines buried in the spoil, the trank trap becomes lethal under full view of friendly weapons.

KENNETH R. KOTHE
Director
Geograhic Sciences
Laboratory

Sir:

I was quite impressed by Cpt McCloskey's article in your Fall '75 issue on the BEST training program designed by the 237th Engineer Battalion Operations during the years 1973-1975.

As a past member of that organization I would, however, like to correct a few facts.

The so called ''BEST'' training program had been designed, tested and implemented in the same organization during the 1969 through 1971 period. The program was supplemented by construction of several training sites for that purpose, to include an excellent bridge site on the Neckar river on the outskirts of Gundelsheim.

The program was considered quite successful and the last I knew, it was considered for implementation USAREUR engineer unit wide.

The credit for the design of the training program definately should go to Colonel's Hartman and Focht, the battalion commanders during period '69 through 71.

HUGH A. KALNS
Sergeant Major
USA ROTC Instructor Group
Saint Lawrence University
Canton, NY 13617

OPMS and the Reserves

Engineer Staff

The importance of the modern-day "citizen-soldier" has been repeatedly emphasized, and broad directives have been recently issued to upgrade the training level of Reserve forces for use during a potential mobilization. Experienced reserve officers will be needed to "beef up" the fighting forces when a real crisis develops. Army Reserve officers currently improve themselves on an idividual basis, and there is no system to verify that enough officers are being trained in the critical skills needed for effective performance of duty during a call-up.

The Officer Personnel Management System-United States Army Reserve (OPMS-USAR) will provide an experienced, well-trained corps of Reserve officers capable of performing as mobilization assets.

The OPMS-USAR Program is designed to insure Congress and the Department of Defense that Army Reserve officers will be ready for mobilization when required. The program is being designed to quickly achieve several key objectives and will assist in identifying and classifying what the Army has currently available for immediate recall from Reserve officer assets. All career Reserve officers will have a readily-available Career Manager to provide training, develop guidelines, and audit the Reserve officer's duty performance.

Key OPMS-USAR objectives closely parallel the critical mission responsibilities of the Army's Reserve components and will: develop and train officers in the right numbers, with the right skills, to meet the "One-Army" mobilization requirements; provide officers a personalized, professional development plan that includes rotation within the ready reserve; and improve the training, motivation, professional satisfaction, and retention of quality officers in the USAR.

The program will manage each officer as a unique individual, and consideration will be given to the realities of citizen-soldier status. The needs of the Army and the professional developmental needs of the officer will be the key assignment considerations. In addition, command responsibilities and prerogatives and readiness of Troop Program Units must be evaluated. Geographic constraints, job and family commitments, community responsibilites, and the amount of time the individual officer can give to military activities will also be carefully considered when managing the career Reserve officer. Career Reserve officers not on extended active duty will be given a centralized, professional development and management program similar to the Active Army OPMS. Training funds will be used to teach the skills officers will need if mobilized.

A highly successful program — Counterpoint Training — has been developed to train Reserve officers with Active Army units to improve and update required military skills. The Reserve officer will also complete military education requirements to keep pace with technological advances in military areas.

The reservists' OPMS will be implemented over a 3-year period, from FY 77 through FY 79. During FY 77, approximately ten per cent of the USAR officer force (10,000) will come under the umbrella of centralized management, and in FY 78, another 26,000 officers will be brought into the system. During FY 79, the remaining 35,000 officers will be included.

Both unit and non-unit officers will be managed and will be rotated between unit and non-unit status as required by the professional development plan prepared by the officer's career manager. The approach to professional development will be based primarily on development of a single specialty with limited training and assignments for alternate or acquired specialties when appropriate. Additional specialties will be validated based on military-related civilian skills and specialties acquired through unit assignments. Officers will be phased into the system on a geographic basis by Readiness Regions to insure proper coordination and control.

489 STOP SIGN P

LT Anonymous

I am the Earthmoving Platoon Leader from "Battling Bravo" Company, 94th Engineers ("We aid our allies") stationed in Darmstadt ("The Pearl of Hessen"), Germany. I control an imposing fleet of equipment: four proud dozers, three spirited graders, four arrogant 290M tractors with scrapers, and twenty other pieces of ready, willing, and able engineer equipment. The motto for my platoon epitomizes our "can do attitude" and aggressive elan: "Just show us where, we'll shove it there." When I initiated the motto, the troops were reluctant to shout it as they saluted, but since they abreviated it to "Shove it, sir!" I have noticed a marked increase in enthusiasm and the motto seems to be serving it's purpose.

With proper humility I consider myself a polished member of the Corps. A graduate of both Engineer Officer Basic Course and the Construction Officer Course, I am a finely tuned, highly trained manager of resources and a leader of men. Armed with the fourteen traits of leadership (Chapter 2, FM 22-100, p 2-1) and the Engineer School programmed text on "The Critical Path Method," I am convinced that there is no hurdle too high, no distance too great, no problem too complex for the Engineer Small Unit Leader (MOS 1328). Everything falls into place when faced with organized charisma.

Editors Note —

In the midst of demanding construction tasks, training for and conversion to Combat Heavy and the myraid of demands placed on the engineer small unit leader, it is encouraging to note that a sense of humor still abides.

This article deals with my successful attempt to combine the two critical skills of management and leadership, in the execution of a high priority construction project in USAREUR. This project, with its intricate construction complexities and innovative techniques, makes it well worthy of note by this magazine's erudite and discerning audience. The S-3 (Wombat In Charge of Operations) called me in his office in October 1975, and told me, "I have a difficult and dangerous mission, I need an Engineer Small Unit Leader." "Just show us where, we'll shove it there, sir!" I replied, rendering a smart salute. The mission was to place in the ground 489 traffic signs on the interior roads of an abandoned ammo dump. At first I could not see the strategic importance of the task, but the S-3 dispelled all my doubts. If the enemy captured the abandoned ammo depot and found no signs on the interior roads, they would know it was abandoned. I was awed by the insight displayed by the S-3, but knew that I, too, in future years, would have the experience to see things so clearly.

Placing 489 traffic signs in the ground would seem difficult for a no-time-in-grade second lieutenant, but in the Basic Course, we had solved

much harder and difficult problems. I knew intuitively that the end without the sign was the end that went in the ground. I knew (for I am an extremely observant person) that the signs had to be placed where they could be read by oncoming traffic.

What I did not know was how to place the signs into the ground. It is hard to sharpen the end of a metal pipe. I remembered from the Construction Officer Course that all the answers required by an earthmoving platoon leader could be found in the Roads and Airfields TM. I studied the TM and in no time at all I deduced that what I really needed was a mass diagram. The project specifications said that the signs has to be anchored one meter into the ground, at specified intervals along 5 miles of road. So very simply I first needed to make a one meter cut along 5 miles of road. Now I had to find some way to suspend my signs while I backfilled with my dashing dozers. All good officers, when they are stumped, rely on the experience of their subordinates (FM 22-100, chapter 8), so I approached my Platoon Sergeant with my plan and my problem. He just laughed and said, "Why don't we borrow some cranes from the line platoon?" FM 22-100 is always right, subordinates come up with good ideas if you just show enough consideration to consult them from time-to-time. The next problem I solved myself. How was I to know when I had backfilled enough around the signs? First, I thought of using the Battalion Surveyors, but then I was hit with one of those flashes of brilliance with which I am blessed from time-to-time. I had each pole painted with a red ring one meter from the bottom of the pole! Then all I had to do was backfill to the red ring! The next question was how to compact the dirt once it was backfilled around the signs. Again, stumped, I asked my NCO. Again, laughing (for it was routine to him), he said, "Let's cut off the signs at the ground, compact, and then weld the signs back on the stems." Now you might think I had a particularly bright NCO, but I don't think so. I credit it to the fact that he had just returned from NCOES. As I finished all my planning and estimating, I noted that the bill of materials for the project included "umpteen" tons of concrete. At first, I thought some inexperienced designer had made some stupid mistake, but remembering my lack of insight in not realizing the overall importance of the project, I thought harder. Then I knew. The concrete must be for a sidewalk. The enemy would never think the depot was abandoned if it had a 5 mile long sidewalk. The amount of concrete I had on the BOM spread over 5 miles came to a ½ inch thick slab. This puzzled me for a while until I realized that the concrete did not have to be a sidewalk. It just had to look like a sidewalk. Tactical deception at its best (FM 31-40)!!

The ultimate reward for any effort is the praise by one's leaders. I remember the day the battalion commander came to my project. Everything was going like clockwork. On the front part of the road, my valient 290s were making the required one meter cut. Behind them, along the road, the two stalwart cranes suspended two traffic signs as two determined dozers backfilled. Further down the road the stouthearted company maintenance contact team was cutting the signs off at the ground with a torch. Up the road from them the lumbering 290M bobtails with sheepsfoot rollers were compacting. Right on the tails of the bobtails was a skillful grader cleaning the dirt off the top of the severed poles, and close behind the grader, a team of dedicated welders was reattaching the signs to the stems. Behind the welders came the contracted concrete trucks spreading a thin layer of concrete. The concrete trucks were followed by a squad of inspired men who evened the concrete with hoes and rakes. The battalion commander surveyed the scene and asked me, "Is your platoon fully committed?" I took my chart and showed him that every man was utilized every day on the project. There was 100% utilization! The battalion commander turned to his S-3 and said words I will never forget, "This is an Engineer Small Unit Leader." Buoyed, I broke in, "Just show us where, we'll shove it there, sir!" and I rendered a smart salute.

HELPING HANDS

SGT Jerry Condo

Butler County, Ohio, residents are using Somerville Road again — thanks to the Ohio Army National Guard.

When a World War I era bridge over the road had to be closed and razed recently, members of the 1193rd Engineer Co., 512th Engineer Battalion, Cincinnati, O., responded by spending their drill weekend, March 20-21, putting in a panel bridge as a temporary replacement. An estimated 700 vehicles use the road per day, according to William R. Foster, chief deputy engineer for Butler County engineer's office.

The effort by the Guardsmen means residents will not have to make time-consuming detours. School buses and fire trucks use Somerville Road as the major access route to the northeast quadrant of Oxford Township. The Guardsmen liked the on-the-job, hands-on training.

SP-4 Greg Ionna, 24, Cincinnati, said that, "I think this is a lot better than spending a weekend at the armory."

SFC Johnny Jones, 32, Loveland, Ohio, first shirt of the 1193rd, felt that the bridge assembly "builds morale. The Guardsmen are doing something meaningful." Foster said the engineer's office "is very pleased with the assistance."

So was Mrs. Donald Hoffman, a Somerville Road resident. "The bridge sure makes it more convenient for me," said Mrs. Hoffman, as she watched the troops put the panel bridge in.

The 1193rd is a unit of the Columbus-based 16th Engineer Brigade, commanded by Brigadier General Jean G. Peltier.

HEAVE, HO — Ohio National Guardsmen launch part of a panel bridge across Somerville Road in rural Butler County, O. The members of 1193rd Engineer Co., 512th Engineer Battalion, Cincinnati, O., put the bridge in on their March 20-21 drill weekend as a replacement for a bridge that had to be razed. The Guard-owned panel bridge will remain on the site until the Butler County engineer's office begins construction on a permanent replacement structure. Meantime, county residents have no need to make time-consuming detours.

HOW AN EARLY BIRD GOT AN "F"

General Bruce C. Clarke

As a Captain in the Corps of Engineers, I was in the last Regular class at C&GSC; which graduated early in 1940.

In January, the final two-sided map maneuver was held. The Red side was a Corps of two Infantry Divisions. The Blue side was a Corps of three Infantry Divisions. Each Division had an Infantry Tank Company organic for the problem — Blue was on the offense. I was the Division Commander of the Blue left Division making the holding attack. The Red left flank was being enveloped in the Blue Corps plan of attack.

The morning of the third day of the problem I had moved my Tank Co. behind one of my front line regiments. That morning I attacked with an Infantry Regiment in a column of battalions — the Tank Co. was attached to the rear battalion. My order to the Regimental Commander was to push hard in a column of battalions, make a breakthrough and then push the rear battalion through. The Tank Co. was to push fast ahead and attack the town in the Red Corps rear in which I had guessed the Red Corps Headquarters was located.

This happened quite quickly; before the problem controllers could stop it. By 10:30 A.M., the Tank Co. was in the town and had captured the Red Corps Commander and his Headquarters.

There was much consternation in the school. The problem had ended a day early than was planned.

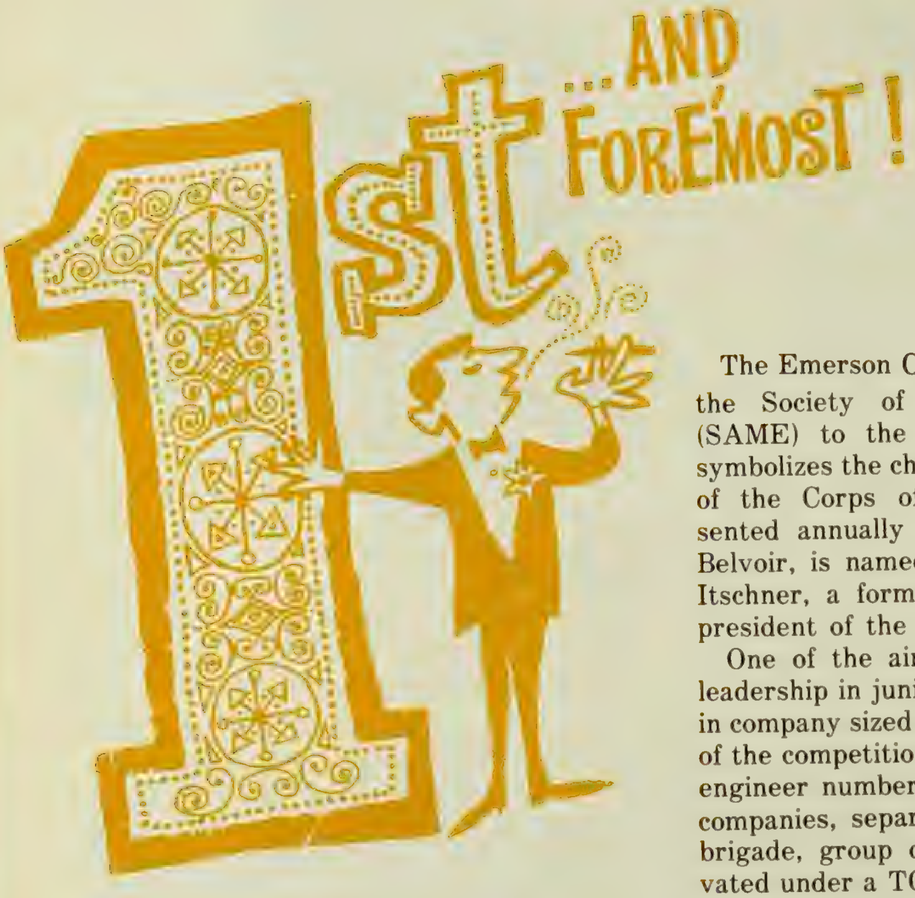
In the critique which followed, I was criticized severely for my action. I was told that I had misused tanks because tanks were never sent into towns — that I had broken my tanks away from the protection of my Infantry in doing so. It was inferred that being an Engineer, I would not understand such things. My rating as a Division Commander was "unsatisfactory." This was the last rating I received in my course at C&GSC.

Maybe because of this, I received orders to the 7th Mechanized Brigade at Fort Knox, Kentucky, to organize the first Armored Engineer unit in the Army — the 47th Engineer Troop, Mechanized.

Three years later, as my CO "A," 4th Armored Division, leading Patton's 3rd Army across France, arrived at the Moselle River facing Nancy, I decided to move about 30 miles to the left, quickly bridge and cross the Moselle and, with Abrams' 37th Tank Battalion (Reinf) leading, to drive deep into the enemy rear. From my L-4 plane, I noted a couple hundred German vehicles parked on the streets of Arracourt off to my right. I turned COL Abe south and told him to over-run Arracourt at all speed. He did this, captured the German Corps Headquarters defending Nancy and the Moselle line. I closed my Combat Command in the Arracourt area. We were behind three German Divisions. There was panic in their ranks. We destroyed most of them as they streamed to the rear unit by unit.

I thought more than once of my "F" at Leavenworth, but Patton's "A" plus erased it during my post-graduate course in the use of tanks with the Armor and Engineers.

THE



The Emerson C. Itschner Award is awarded by the Society of American Military Engineers (SAME) to the engineer company which best symbolizes the character, mission and performance of the Corps of Engineers. The award, presented annually at the Engineer Dinner at Ft Belvoir, is named in honor of LTG Emerson C. Itschner, a former Chief of Engineers and past president of the society.

One of the aims of the award is to promote leadership in junior officers and to foster "espirit" in company sized engineer units. For the purposes of the competition, company sized units include all engineer numbered and lettered or headquarters companies, separate or belonging to a battalion, brigade, group or larger organization, and activated under a TOE/TDA. In the past, the award was limited to active duty units. In 1974, the competition was expanded, providing separate awards for both National Guard and Reserve units.

The winners for calendar year 1975 were as follows:

ACTIVE ARMY: Company B, 10th Engr Bn, 3d Inf Div, 7th US Army, Germany. The unit was commanded by CPT Albert Kraus.

ARMY RESERVE: Company D, 463d Engr Bn (Const), 99th ARCOM, 1st US Army (Penn). The unit was commanded by CPT John E. Barnes.

NATIONAL GUARD: HHC, 1457th Engr Bn (Cbt), Utah ARNG. The unit was commanded by CPT Ronald H. Skillcorn.

Although the designation of a single winner from a field of highly qualified finalists is a difficult chore at best, the Itschner Award Selection Committee would like to see more units compete for this award. The key to turning out a winner, in addition to having the qualifying credentials, is to adequately document the unit's activities over the course of a given calendar year.

How does your unit compare to the best? The Itschner Award is one way to find out. Here's to a successful year during 1976.

Engineer Staff

ITSCHNER AWARD PRESENTATION

DISPLAYING THE ITSCHNER AWARDS — Presented to them by Lieutenant General W. C. Gribble, Chief of Engineers, are from left: CPT Albert Kraus, Commander, Co B, 10th Engr Bn, 3d Inf Div, 7th US Army, Germany; LTG W. C. Gribble; CPT John E. Barnes, Commander, Co D, 463d Engr Bn (Const), 99th ARCOM, 1st US Army (PENN); and CPT Ronald H. Skillcorn, Commander, HHC, 1457th Engr Bn (Cbt), UTAH ARNG.

ENGINEER R&D

Major Jack Chase

Historically in the field of military research and development there has been difficulty in arriving at a commonality of thought in defining R&D efforts. Determining what is an appropriate R&D problem may be perceived one way by the military and in an entirely different way by the research community.

On one hand, military users may not be abreast of R&D developments. They may be unaware that a problem can be solved by using newly developed equipment or techniques. Or, the military at the user level may believe that researchers have come up with a panacea to solve a problem when, in fact, the state-of-the-art falls far short of a solution.

On the other hand, researchers often (though usually unintentionally) widen the communication gap by expressing their capabilities in needless technical detail or in terminology so different from and unrelated to day-to-day operational problems that practical applications may never be realized. This is especially true in those areas of research which are not particularly oriented toward developing a specific hardware end item. Still another problem occurs when pet projects are pushed by scientists and engineers to enhance their professional prestige and job security. Sadly, every dollar pounded into the bottomless rathole of projects such as this could be better spent doing relevant, valid R&D which could save the lives of men on some future battlefield.

The engineer research and development effort has not escaped being taken to task for some of these reasons. Perhaps the nature of engineer R&D has made it easier to criticize and question its validity. While some engineer R&D is hardware oriented, many engineer efforts such as terrain analysis or military geographic intelligence are largely concerned with procedures and methods. These types of efforts have less direct application and results are not as easy to see. It is difficult for these non-hardware R&D activities of a combat support nature to compete with major weapons systems that have a direct effect on the battlefield.

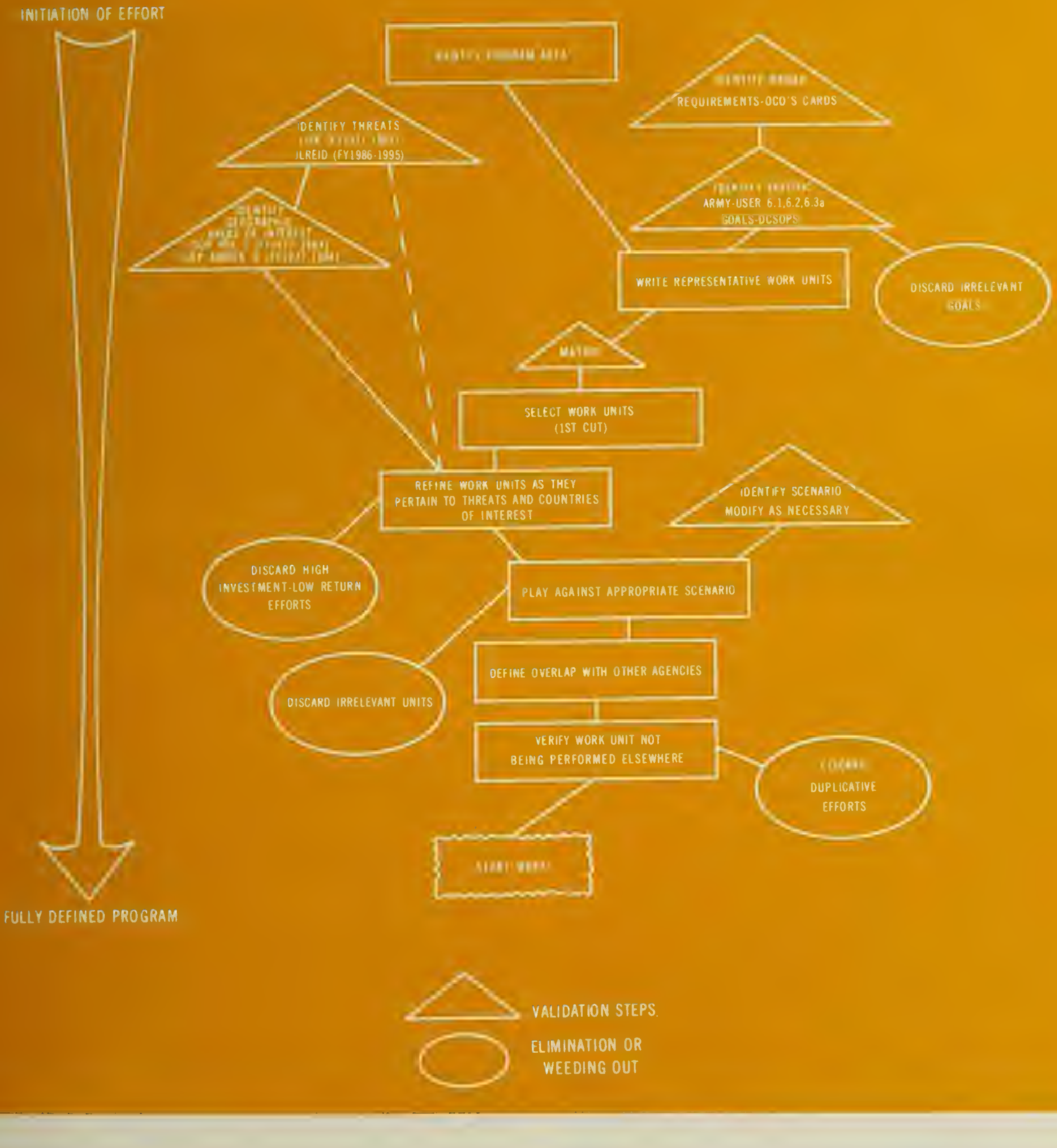
This does not mean that engineer R&D is any less important — quite the contrary, it has a vital function if the Army is to be responsive and capable of winning the first (and perhaps the only) battle in any future way. The challenge lies in designing programs which are based upon proved and validated criteria which apply the right balance of basic, long-term research, applied research, and technology transfer.

This is no easy task. What follows is an example of a method developed by one Corps laboratory in order to have a responsive research program in one predominantly non-hardware oriented area. The program area happened to be remote sensing; however, the principles of such an approach might be applied to many other areas.

In 1975, the Engineer Topographic Laboratories (ETL), at Fort Belvoir, became concerned that the rapidly expanding capability for collecting reconnaissance imagery was outstripping the Army's ability to interpret and use it. Basic photo, infrared, and radar interpretation methods had to be modified and updated to reflect changing Army priorities and operational concepts. In an effort to insure that the ETL R&D effort in remote sensing was oriented and responsive to tactical operational exigencies, the Commander and Director formed a Remote Sensing Study Team in April 1975. Comprised of four Army officers and four civilian consultants with specific remote sensing expertise, the task force's objective was to develop a concept for the use of remote sensing to support military operations in critical geographic areas of the world. The flow diagram illustrates the procedure ETL used to arrive at a fully defined program.

This team began by studying the Joint Intelligence Estimate for Planning (JIEP) FY 1977-1985, and the Joint Long Range Estimative Intelligence Document (JLREID) FY 1986-1995, in which the Joint Staff identified the probable threats most critical to the U.S. national interest. The Joint Strategic Operations Plan (JSOP) FY 1977-1984

PROCEDURE FOR DESIGNING A MILITARY R&D PROGRAM



provided a list of specific high-interest countries. From these, the team selected an area of conflict and intensity for wargaming.

Parallel to this effort, they identified broad Army requirements from the Operational Capability Objectives (OCOs) and the Catalog of Approved Requirements Documents (CARDS). This identification process was made easier when the team discovered that DCSOPS had ranked in order of priority all the validated Army-user R&D goals. While many of the goals were written with specific hardware items in mind, the team realized that in several instances the goals could be partially accomplished by improving remote sensing techniques. For example, the development of an improved area-denial system such as a soil destablization device might be a goal; remote sensing could support accomplishment of this goal by providing the means to identify areas of marginally stable soils.

All of the Army-user goals were analyzed in this manner. Brainstorming would be a more accurate description; for at this stage the task force was more concerned with the total spectrum of what remote sensing might offer in light of Army requirements. Any idea, no matter how wild it sounded, was considered fair game. Some goals were obviously irrelevant to any remote sensing application and were discarded immediately. Nevertheless, the team compiled a long list of potential work units. At this stage, no attempt was made to restrict these work units to a particular organizational mission; in fact, they fell rather haphazardly across division, laboratory, and even agency boundaries.

Next, work units were put into a matrix based upon DCSOPS approved priorities and approved development times. This formatting highlighted the more critical areas of research.

It followed then, that if the critical research areas as identified were applied to the priority areas of the world, the general scope of research in remote sensing would be defined. With this accomplished, the work units were refined and a number of high investment-to-return efforts identified and discarded.

At this step in the process, only one of the essential inputs had not been entered. How would the results of this research ever be applied in the projected land-combat structure of the Army? Doctrine, organization, and tactics had to be considered. TRADOC's Scenario Oriented Recurring Evaluations System (SCORES) provided the answer.

Taking the SCORES scenario which was most representative of the priority geographic areas identified in the threat analysis, the study team wargamed each of the work units. In this fashion, irrelevant work units were identified and discarded. The others were modified as required by the environment and the tactical situation.

At this point, it became necessary to evaluate each remaining work unit in light of the ETL mission and ongoing efforts in other agencies. Areas of duplication were discarded from further consideration. When it was all boiled down, out of 96 R&D goals and over 50 possible separate work units, a total of 4 work units were selected to implement the initial program.

Was it worth it? You bet it was. About a half man-year of effort went into designing the program. Out of this expenditure of effort came a balanced and relevant non-hardware oriented engineer R&D program which is based on stated needs. This program insures that R&D money will not be shoved down ratholes in wasted efforts.

Summarizing, some of the advantages to the procedure are as follows:

- Only DA and joint service approved independent variables are used, e.g., geographic areas, research goals, priorities, development times, levels of conflict, and general scenario play. By using these, in-house uncertainty and personal bias in these areas are eliminated.
- A program derived in this fashion is easy to justify. When the generalogy of each work unit can be traced directly back to Army stated needs, threats and doctrine, individual scientists and engineers can spend less time defending their program and more time doing productive research.
- Military research is goal-oriented — not open-end and irrelevant.
- The procedure provides freedom of individual scientific pursuit while retaining a structure to enable management and orchestration of work efforts.
- The procedure provides justification for emphasizing high-potential research and shelving non-productive efforts.
- Finally, the procedure is an approach which can be adapted to virtually any type of research — in particular that which relies on refining techniques and methodologies rather than specific end items of hardware.

Winning the first battle is half the effort — the rest of the effort is the planning which goes into it — planning which can be traced back to the design of individual R&D programs. If these R&D efforts are poorly designed and based on faulty criteria, that first battle — no matter how brilliantly fought — will in all probability be lost. It would seem that all engineer research and development programs should be carefully scrutinized to insure that they are responsive and truly reflect the needs of the Army in light of today's international situation. Only then can we say with confidence that we're doing our best for the Army.

Major Jack Chase is an armor officer assigned to the Center for Remote Sensing, U. S. Army Engineer Topographic Laboratories (ETL). He was formerly the Deputy Commander of ETL. A graduate of the United States Military Academy, he has a Masters Degree in geology. He has held key advisory assignments in Thailand and Vietnam. Major Chase has been an Instructor and Assistant Professor of Military Science at the Ohio State University and the University of Vermont. He has commanded units in Germany and the United States.

EADS BRIDGE

MAJ Ralph W. Gilbert, Jr.

These outstanding nineteenth century engineers clashed over two significant projects during the same period in American History. Each was firmly convinced that his own ideas were correct; both used technical and political skills in their efforts to overcome adversity. History now shows who was the more successful. An interesting story unfolds as we observe the men themselves, their relationship to each other and the reflection of similar conflicts in today's world.

Andrew Atkinson Humphreys, born in 1810, came from a family of naval architects. He is well known to members of the Corps, having served as Chief of Engineers nearly thirteen years, beginning in 1866. He is credited with approving the establishment of the original Engineer School at Fort Totten, New York, and with the cofounding of the National Academy of Sciences. Humphreys, a West Point graduate, fought with distinction during the Civil War, rising to the rank of Major General. He lead the Second Division, III Corps at Gettysburg, and the II Corps at Appomatox. Following the War, he continued service as the Philadelphia District Engineer. Prior to his appointment as Chief of Engineers, he conducted a survey of the Mississippi River levee system. This was familiar work for Humphreys who, as a junior officer, in the early 1850's had performed a topographic and hydrographic survey of the Mississippi River. He and Lieutenant Henry L. Abbot published their findings in the text, *Report Upon the Physics and Hydraulics of the Mississippi River*, which was recognized for many years as the "Bible" on hydraulic engineering. It was translated into four foreign languages and helped to establish Humphreys as an expert in this field.

The person of James Buchanan Eads is less familiar throughout the Corps today than is Humphreys, primarily because he was a civilian rather than a military engineer. Eads, born in Laurenceburg, Indiana, in 1820, came to St. Louis, Missouri, via Cincinnati and Louisville. He was the son of a less than successful real estate speculator. A formal education was out of the question for young Eads; therefore, he instead satisfied his thirst for knowledge by reading through the local grocer's technical library. Financial success came early in life to Eads when, at age nineteen, he opened a river salvage company,

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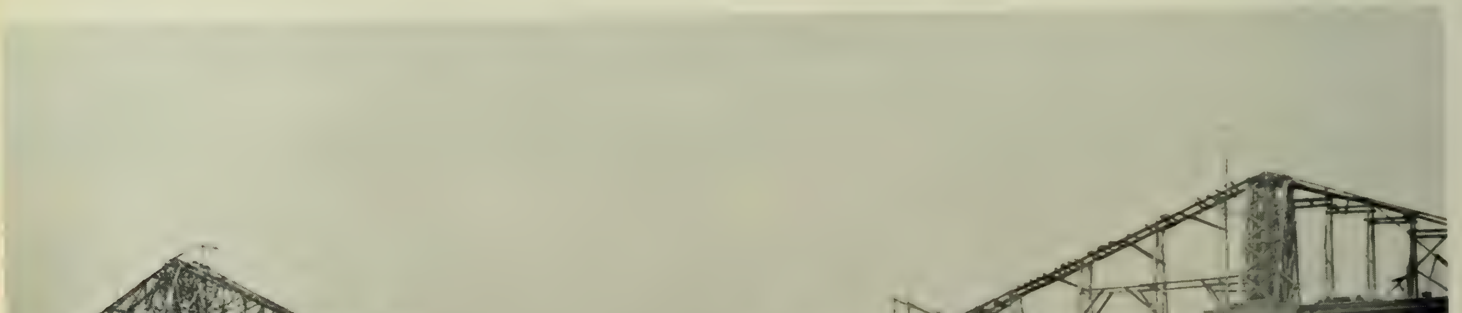
using a diving bell of his own invention Within the next eighteen years, he was to amass a personal fortune of one-half million dollars. With the outbreak of the Civil War, Eads turned his efforts to the manufacture of gunboats for the Union Navy. His ironclads played a significant role in defeating Confederate forces and contributed to the successful campaigns of Sherman and Grant. As we shall see, this contribution was not to be forgotten by Grant in later years.

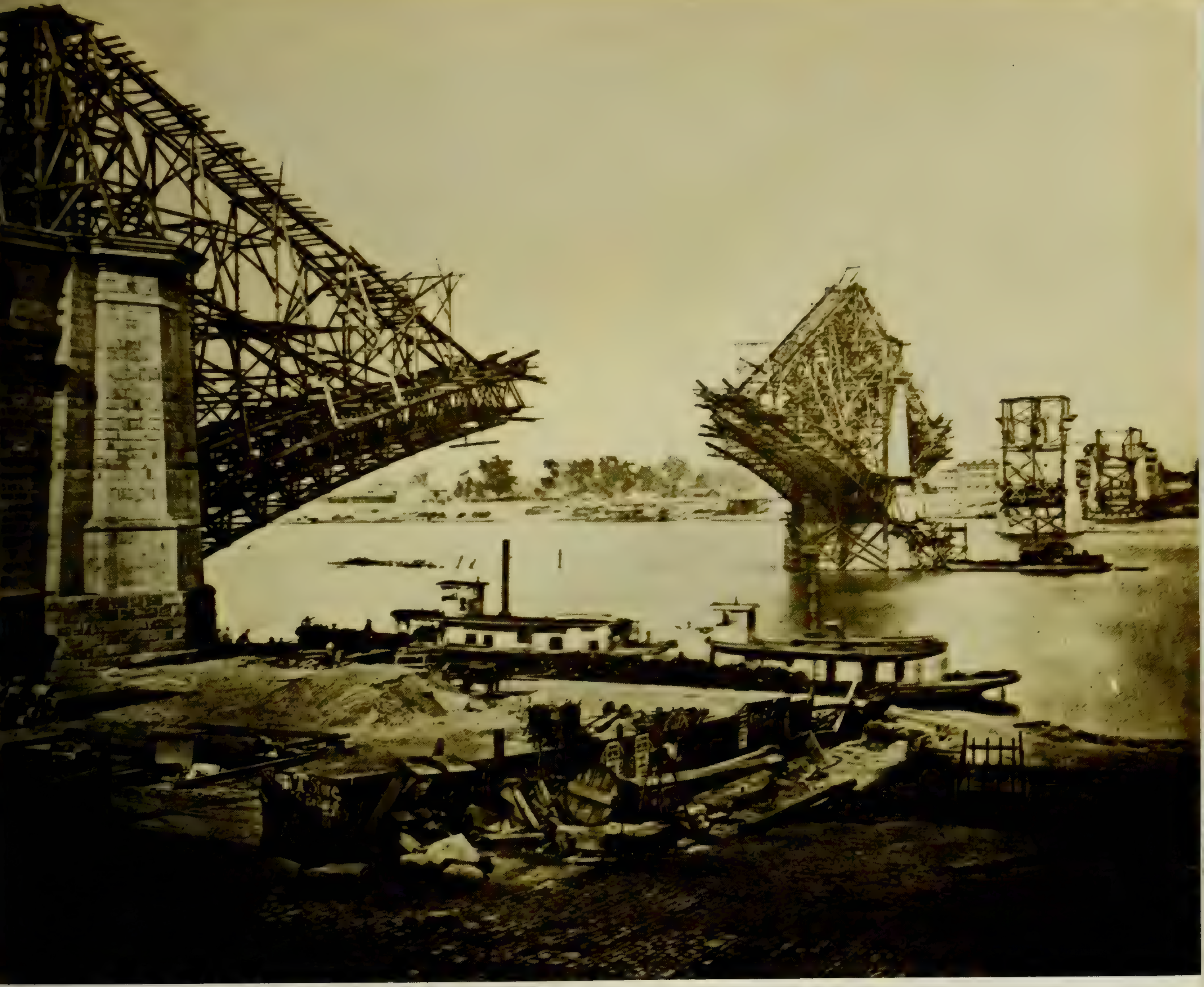
It is interesting to note at this point that during the late 1850's Eads and the Corps found themselves arguing the same case before Congress . . . the need for more appropriations to improve western rivers. The Corps had been charged in 1824 with mapping and maintaining the nation's navigable waters. Congress had done little, however, to finance these tasks. As an example, only $75,000 was appropriated for maintenance of the entire Mississippi and Ohio Rivers in 1824. Neither the Corps nor Eads were successful in their fund raising efforts until after the war.

Eads' interests were not tied solely to the river. As railroads moved westward, there developed a pressing need for a major link across the Mississippi at St. Louis. Eads turned his genius to the solution of this problem. Several proposals, by such noted bridge designers as John Roebling and Charles Ellet, as well as others, eventually gave way to Eads' plan for three steel arches springing from stone piers and abutments resting on bedrock far below the surface. The center span of 520 feet was to exceed any arch bridge of that day by over 200 feet! Each side span was to be 502 feet with a dual railroad and roadway incorporated into the structure. It was to consist mostly of a new material . . . steel . . . which was still relatively unknown in America. Many of Eads contemporaries thought the plan impossible and said as much. Eads' confidence and salesmanship were convincing enough for Congress, however, who authorized construction of the bridge by an act on July 25, 1866.

As Chief Construction Engineer, Eads hired Henry Flad, a graduate of the University of Munich and former Corps of Engineers Colonel. It



Erection of West Arch showing cables to joints 6, 9, and 12.



West and Center Arches. View looking North-East.

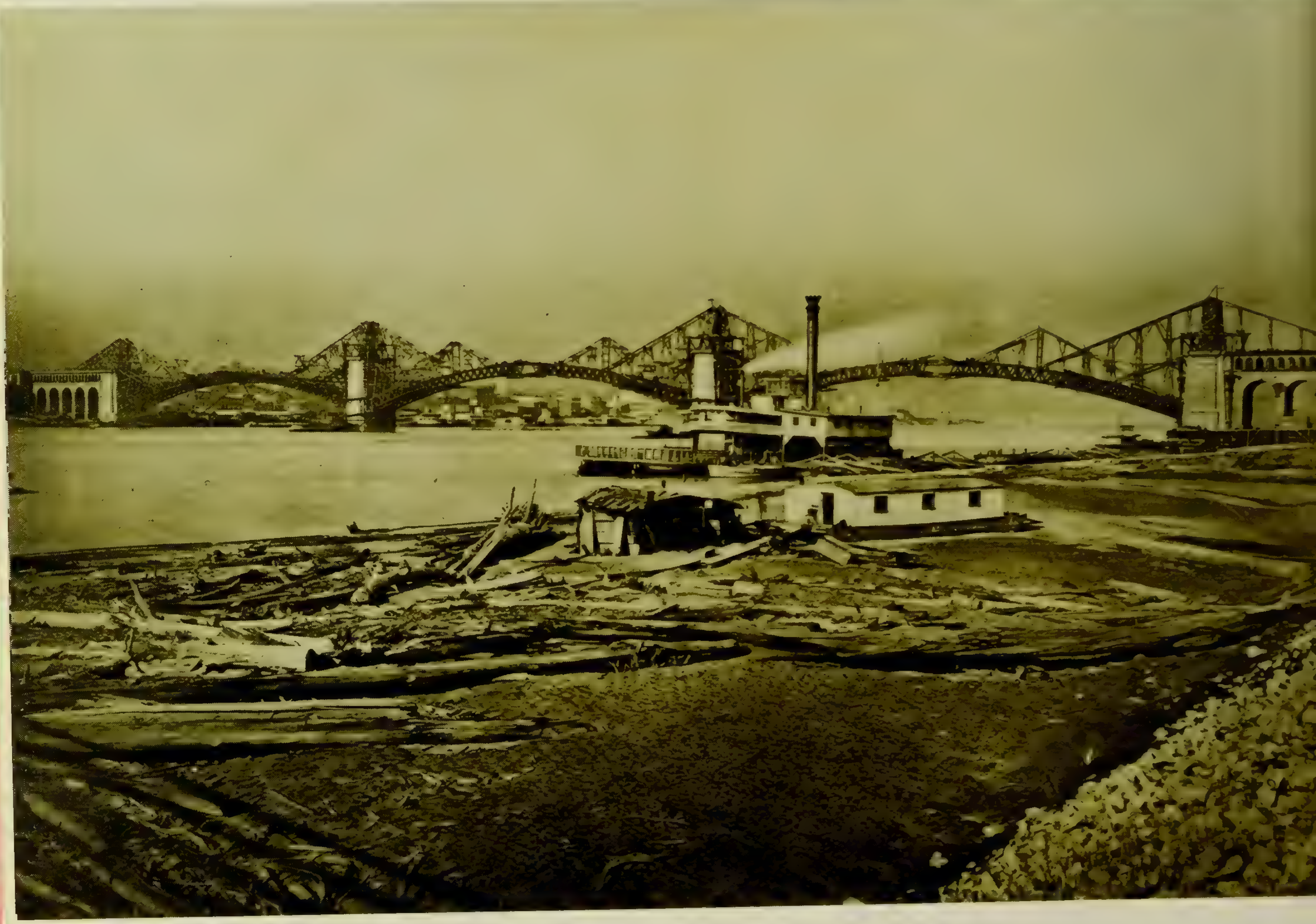
was Flad who developed the cantilever method of construction to the unprecedented extent needed for erection of the St. Louis Bridge. Work began on the first abutment foundation on August 20, 1867. Despite numerous challenges from other bridge companies, navigation interest, and even from a tornado which struck the bridge, work continued until September, 1873, when the first steel arch was closed. Ice packings were used to contract the ribs in order that the final member could be placed. Interestingly enough, a similar technique was required to close Saarinen's Gateway Arch which today overlooks Eads' Bridge.

As the bridge neared completion, some six years and six million dollars after start of work, it was again challenged by a most formidable foe . . . the Corps of Engineers. Navigation interests had finally convinced officials in Washington that the bridge was too low for steamboat smokestacks. On August 20, 1873, exactly six years after groundbreaking, Army Special Order 169 appointed a board of engineer officers to examine the construction of the bridge and to make recommendations as to its modification or *removal.* The board was to report to General Andrew A. Humphreys, Chief of Engineers. They met for two days in September, heard arguments for and against modification of the bridge, then closed proceedings to write their report. Eads was never summoned to appear. He was, in fact, not even in this country at the time of these proceedings, being away on a fund-raising campaign in Europe.

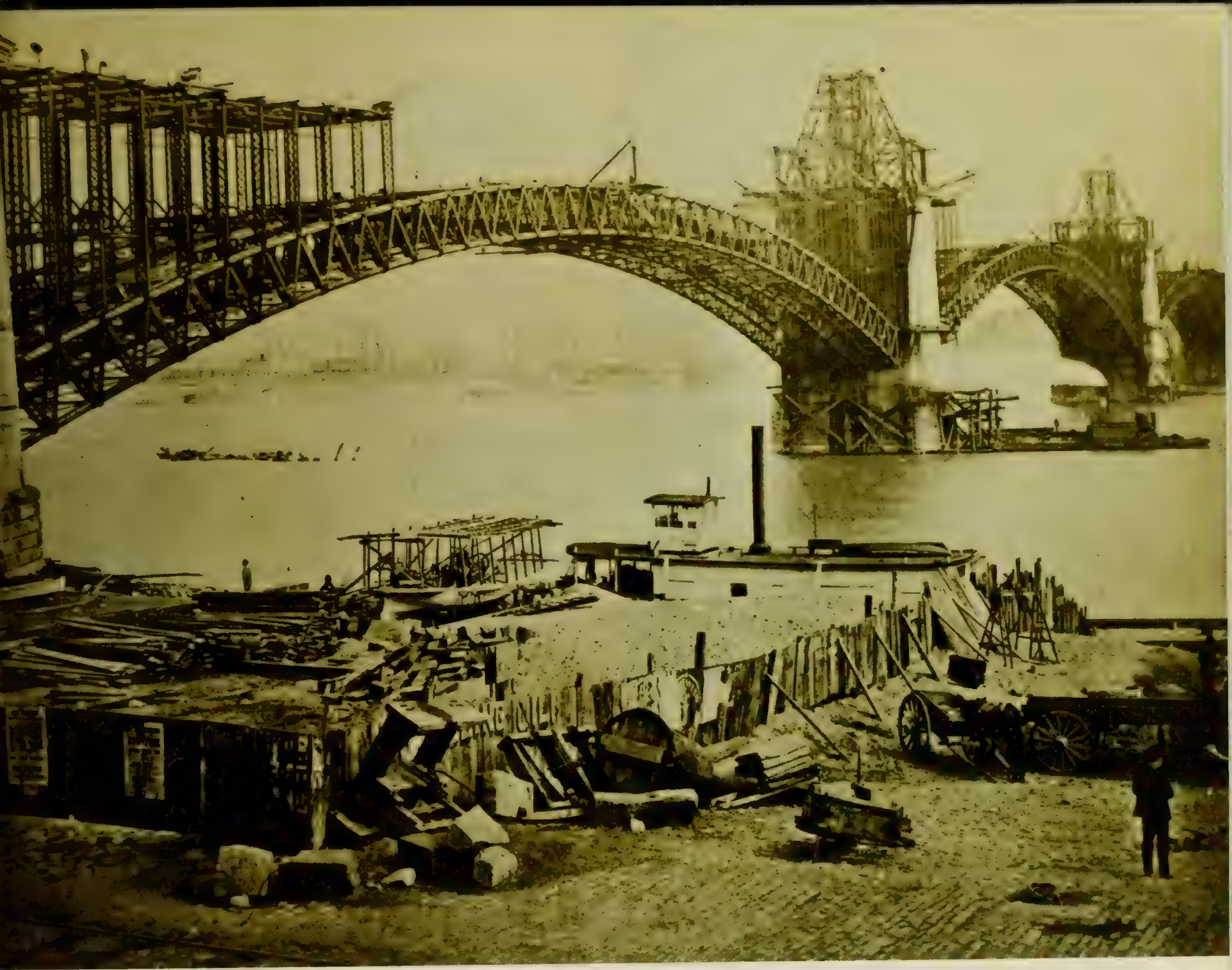
The board submitted its report to Humphreys within the week, recommending major modifications to the structure. Humphreys approved the report and forwarded it to Secretary of War, General William W. Belknap, stating that the bridge should either be modified as recommended or *removed completely*. Meanwhile, Eads had returned from Europe, and upon hearing of the board action, went directly to Humphreys in Washington, D. C. Little is known of what transpired at this meeting except that Eads left without receiving any satisfaction, proceeding directly to visit his old acquaintance, President U. S. Grant. It was following this meeting that Grant summoned Belknap and told him and the Corps to "drop the case." This was promptly done! The first confrontation between Eads and Humphreys was decided in favor of the former. This was only a foretaste of other disappointments to come for Humphreys.

The reader will recall that Humphreys was a recognized expert on Mississippi River hydraulics He contended in his text that the formation of sandbars at the mouth of the Mississippi could only be prevented by dredging. Eads, on the other hand, publically challenged this theory. At a public meeting in March, 1873, Eads proclaimed the only permanent solution was to construct a system of jetties which would constrict the flow, remove sediment and prevent future bar formation. A long and heated debate followed, eventually being settled by Congress in 1875 when they voted to back Eads' proposal over the Chief's. Humphreys was so disturbed by this second loss to Eads that he committed one-tenth of the entire Corps budget just to have Eads, jetty project observed. His hopes of discovering an error were dashed when the South Pass was successful completed in 1879, thereby permanently opening the way for New Orleans to become a major seaport.

Humphreys retired that same year, spending the remaining four years of his life in Washington, D. C. Eads continued river and harbor improvement work throughout the U. S., Mexico, and in Europe. He was fighting for approval of a



Closing the Center and East Arches.



The Ribs completed and the roadways beginning.

ship-rail isthmiam crossing at Tehuantepic, Mexico, at the time of his death in 1887.

Eads Bridge, now a national historic landmark, still spans the mighty Mississippi, carrying modern day loads with the grace and beauty that so clearly typifies the principle of "form follows function." Humphreys Hall and, indeed, Fort Belvoir, stand as tributes to Andrew Humphreys. These two men, engineers of outstanding stature, came from different backgrounds, possessed different educations, persued often conflicting ideas, and were both contributors to our great American heritage. Their memory should not be allowed to fade from the main stream of American consciousness.

Symbolically, the opening of Eads Bridge signalled the closing of steamboating days on the Mississippi River, and the beginning of the railroad saga. Not until the mid-twentieth century would water transportation regain its former significance. Today, as in the Eads-Humphreys era, the Corps of Engineers again finds itself involved in the railroad versus water transportation feud, presently contested at Locks and Dam 26 on the Mississippi. Ironically, this project is located a few miles north of St. Louis. One may well imagine how this battle would be fought by our two campaigners of yesteryear. Perhaps the Corps should consider itself fortunate that the opposition isn't being lead by a Mr. James B. Eads.

Major Ralph W. Gilbert, Jr. is currently assigned as an Engineer Inspector General, Office Chief of Engineers, with duty station at Fort Sheridan, Illinois. He is a graduate of the University of Mississippi and holds a Master of Science degree from Princeton University. He graduated from the Command and General Staff College in September, 1974, and is a registered Professional Engineer.

THE "MAN" RETIRES

Engineer Staff

After more than 35 years of military service and nearly three years as Chief of the US Army Corps of Engineers, Lieutenant General William C. Gribble, Jr. has retired from active duty.

In a ceremony held June 30, General Gribble relinquished his command to his successor, Lieutenant General John W. Morris.

Lieutenant General William C. Gribble was appointed the Army Chief of Engineers on 1 August 1973 following approximately 2½ years as Chief of Research and Development, Department of the Army, Washington, D.C.

As Chief of Engineers, General Gribble was charged with many military and civil responsibilities of critical importance to the Nation.

He was the principal advisor to the Army Chief of Staff on all military engineering matters, and as such, directed a 1½ billion dollar annual construction program for the Army, Air Force, and other government agencies.

He also directed the Federal Government's major planning and construction program for the comprehensive development of the Nation's water resources to meet the full range of present and future water-related needs. The program, currently funded at $1½ billion a year, is responsible not only to rapidly mounting material necessities of the American people, but also to the imperative need for the preservation and enrichment of the quality of our environment.

A native of Ironwood, Michigan, General Gribble was commissioned in the Army Corps of Engineers in 1941 following graduation from the U. S. Military Academy, West Point.

Prior to his last assignment, he served in responsible command and staff positions both stateside and overseas. He commanded the 118th Engineer Combat Bn, 43rd Inf. Div.; the U. S. Army Engineer Reactor Group; the Alaska Engineer District; and the North Central Engineer Division, Chicago.

He also served with the Atomic Energy Commission, Washington, D.C.; as Director, Army Nuclear Power Program; and as Deputy Director for Military Construction, Office of the Chief of Engineers; with the Army Materiel Command; and on the Department of Army General Staff as Deputy Chief of Research and Development and Deputy Assistant Chief of Staff for Force Development. In April 1969, he assumed Command of the U. S. Army Engineer Center and Fort Belvoir and became Commandant of the U. S. Army Engineer School there. He became Chief of Research and Development on 1 January 1971 and on that date was promoted to the rank of Lieutenant General.

He received a master of science degree in Physical Science from the University of Chicago in 1948, and has an honorary doctorate in Engineering from Michigan Tech. He is also a graduate of the Army Command and General Staff College, Fort Leavenworth, Kansas and the National War College, Washington, D.C.

He is a registered professional engineer in the District of Columbia and a member of the Society of American Military Engineers and of the American Defense Preparedness Association.

MOTIVATION-

A Staff Officer speaks

Eventually in a soldier's career, whether officer or senior NCO, the time comes when his responsibilities suddenly seem to increase without end. For in addition to his normal TOE position and ever present "extra" duties, he finds himself the program manager of a special project. This can be a challenging opportunity or a career-crushing nightmare. It all depends on the skill and resourcefulness with which the project is undertaken.

While no set amount of specifics can be delineated to cover every situation, certain conclusions can be drawn from past experience to aid the neophyte project manager and, hopefully, ensure his success.

The major attributes required of a project officer are the ability to *communicate*, *regulate*, *negotiate*, and *motivate*. Each ability involves various techniques and duties that must be mastered if the project officer is to be successful in his work.

The project officer's place in the unit structure, while fixed by TOE, is frequently largely dependent upon the size of the project in relation to the size of the unit. His place, then, can be a tenuous one. It depends, to a large extent, on factors beyond his control. Special projects requiring detailed technical competence in planning or design of selected construction or destruction projects are invariably relegated through the S-2/S-3 to the staff engineer. Unlike functional engineers, staff engineers are rarely responsible for an engineering element (detachment), and so, as project officers, they must negotiate for key people to staff their project.

Since project officers are normally appointed from staff positions (and must continue to function normally in their staff responsibilities throughout the duration of the project), their initial problems in project organization are especially awesome, for example, when compared to autonomous TOE elements. Existing element commanders are free to concentrate on the technical excellence of their particular element (whether it be battalion, company, or detachment), and, because of their inherent structure and chain of command, need lose little time adapting to a particular mission. This completeness of a TOE unit highlights a main disadvantage of the project officer's team — the personnel are "borrowed." They are not really "his," and he must create a functional organization based on the project's mission. This attaching of

CPT Jon Thompson

personnel to the project can be advantageous in a small way, however, for the project officer is relieved of many personnel problems and has more time to manage the efforts of the men and equipment under project control. Obviously, the project officer's knowledge has to be broad with respect to functional organizational structures, personnel utilization, and management in addition to being deep with respect to his staff position. Background knowledge and experience such as this are the basis for good program management.

Similarly, a prime requisite for program management is good business sense. It is an asset to the project officer in his effective and economical utilization of the men and material allocated to him by the commander. Few engineers survive as officers unless they study and practice the science and the art of project management. But how can an officer properly prepare himself for project management? The obvious path is to follow up his technical degree with management courses and spend as many years as possible at company (and battalion) level involved as an assistant in the execution of projects before graduating to the position of program manager. But, lacking the opportunity to develop experience at the company level, there's nothing in the Army like starting at the top, even for a program manager.

Assuming that starting at the top is a practical necessity, what — apart from a thick skin and unfailing optimism — makes a good program manager? Many essential abilities spring to mind, such as leadership and the flexibility to effectively coordinate the activities of various supporting elements and engineering disciplines. But above all, a program manager must be able to *communicate*, *regulate*, *negotiate*, and *motivate*. To do any of these well takes the ordered calculation and precision of a science and the wit and imagination of an art.

All supervisors have to possess these abilities, but certain aspects of each are peculiar to a program manager's position. A project officer, or program manager, has to communicate with people at varying levels and in varying units. This includes everything from negotiating with his superiors to coordinating with subordinates. He has to regulate and control their expenditures and performance. He must be able to motivate people who know he has *very little control* over their promotional prospects or efficiency ratings.

Admittedly, these are not the only abilities a program manager should possess, and they really apply equally well to officers and supervisors in every branch. They are certainly not limited to those who are routinely responsible for designing and installing sewage disposal plants, constructing base camps, or building bridges.

- COMMUNICATION

To communicate means to share, transmit, and impart information. To communicate well is both an art and a science, for no one can communicate without having ideas and facts and the ability or skill to transfer them to others. So at the beginning of a program, before the project officer sends people running off in all directions, he should consider carefully what he's asking them to do. However rushed the schedule, he must plan and organize his thoughts, write precise assignments, and relate them to the actions of his key people.

With his thoughts organized, he's ready to follow the first rule of good communication: establish a dialogue between the project officer and the executing staff. To do this, precise assignments must be discussed with each task leader. Face-to-face discussions are essential because written directives are rarely as clear as they should be. Clarification can then be made before distribution.

After opening up the lines of communication, use these techniques to keep them open.

A. Keep in personal contact; make the rounds of each activity at least daily. It's up to the project officer to know what's going on and nip any trouble in the bud.

B. Keep key people in the picture. Besides formal meetings, hold short stand-up reviews around the planning table or in the work area as required.

C. Listen! People think about five times faster than they speak, so when someone is talking it's easy to start anticipating what he is about to say and walk away with the wrong conclusions.

D. Be constructive. Don't demolish a person's ego with criticism of his performance or ideas; build his confidence with constructive suggestions. Remember your responsibility to develop your subordinates.

E. Explain the reasons behind a decision. This works hand-in-glove with keeping key people in the know. If the reasons for a change are discussed, the project officer is likely to get the cooperation he needs.

F. Try to see the other man's point of view. Communication is a two-way street. An officer, or leader, shouldn't ask a man to perform a task that he, the leader, wouldn't do if he were in the man's place. Develop empathy with your subordinates.

- REGULATION.

To regulate means to reduce, to order, or to fix or adjust the time, degree, amount, or rate of performing a function. To regulate, in program management, means to apportion part of your resources to each task and to assign tasks on a timely basis in order to meet the given schedule.

It must be recognized that this is a continuing requirement throughout the course of a project.

The materials proposal and master plan are available to the project officer as sources of guidance in the general breakdown of manhours to be allocated to major tasks. From this information, he'll be able to approximate the type of support he'll need from various adjacent, subordinate, and support organizations. His projected support requirements will be used by these organizations for long-range planning.

Now comes the difficult part. It's never possible to specify in detail the work that has to be accomplished during the whole mission. On the other hand, if the officer in charge gives broad-brush manhour breakdown directives like "base camp perimeter construction 800 m-hrs," he's not only failing to communicate detailed requirements but he also has absolutely no control over material expenditures or schedule. A further example of bad regulation is an open-end request like "upgrade demolition range *as required* — 400 m-hrs." The officer in charge (OIC) of the project cannot expect a maintenance element supervisor to take him seriously if he presents such direction.

The way to avoid these situations is to break all tasks into subtasks and state explicitly what must be accomplished within a specified schedule and manhour budget. Immediately, concepts like "the five-paragraph field order" come to mind and similarities are noted. Short duration assignments are essential to maintain program control. Any task that takes more than a month is difficult to specify in detail.

Monitoring performance is of critical importance. This is where a good project officer comes into his own. The OIC should be familiar with every assignment and maintain responsibility for monitoring technical performance against the schedule. At the same time, he should require the project staff to plot hours expended against budgeted hours, on a weekly basis. Feedback from these two sources allows the project officer to keep a running account of accomplishments versus expenditures. Those familiar with critical-path-method (PCM) project programming will immediately note the dovetailing of a subordinate project element's CPM program with the OIC's control of the project as a whole and realize the manner in which the critical path method can assure the OIC that his elements have identified and understood the subtasks that comprise their explicit portion of the mission.

Such precision is absolutely necessary, for the best way to regulate expenditures is by issuing explicit directives in the form of short-duration task assignments and closely monitoring performance.

- NEGOTIATION.

Regulation may be reduced to a science, but negotiation is mainly an art. To complete a program properly, the organization needs sufficient time and materiel. This is easy enough to say, but it's up to the project officer to see that it happens. Therefore, he must be astute at the negotiating table and smart enough to work out the "political" problems that invariably arise during the course of a project.

The project officer's briefings with his commander very often take on aspects similar to civilian contract negotiation. We've all heard of the car salesman who, when asked the price of a car, replied, "It depends on whether you're selling or buying." That applies to the commander's resources also; but, for the purpose of this discussion, emphasis will be placed on the seller's role. In this case, that is the project officer's role.

The commander has many different projects clamoring for his attention, time, men, and material. Even if the "need" for your project has been recognized and it has command sanction and approval, it will still be necessary to receive an adequate priority and the time, men, and material to do an adequate job. It involves competitive negotiation to win a high priority and the necessary support. The project officer must defend the manhours and materials specified in his project proposal. To do this, he must break down major tasks into subtasks and be prepared to discuss hours required by labor category for each operation. This can be a tedious job at best, but it should follow logically from task assignments. However, since preparation of detailed assignments is frequently a continuing process, the OIC may have to estimate some future tasks to justify his position.

Frequently, the project officer does not know the complete extent of the other demands on his commander's resources. Accordingly, he must balance the emphasis in his proposals and requests so that resources estimates do not denigrate his ability to meet mission requirements. He should never plan to exceed mission requirements, or he may then be told to remove the extras and, accordingly, suffer crippling resource reductions. A technical man will never refuse the offer of more men and supplies to produce better performance, but it would be remiss of his commander to expend additional funds for an "improved" product when a more basic one will suffice. In order to receive the most complete command support, the project officer should stress the advantages of his proposal — reliability, maintainability, and serviceability — which a commander will find difficult to argue against.

A few hints on negotiating are:

A. Insure that the commander's representative has the authority to award you the support required when, or if, you cannot be in direct contact with the commander.

B. Be prepared to discuss specifics by breaking the proposal into hourly tasks. Don't itemize contingencies; spread them among detailed operations.

C. Be patient. It is not only a virtue, it is a necessity. Be prepared to discuss details ad nauseum.

D. Don't underestimate the opposition. Don't be put off by seemingly insane questions. Never slough off a question; treat each with equal sincerity.

E. Be accurate. Never distort the facts to your commander — vis-a-vis — don't B.S. the troops. Defend an opinion to the last breath, but don't exagerate when quoting actual manpower expended or materials estimates submitted.

F. Be prepared to leave something on the table. Preserve manhours if possible, but always have a fallback position. Psychology helps.

Programs are rarely completed without some changes. Every change provides an opportunity to contractually modify the schedule. For our purposes, negotiation is a continuous process until the project is successfully completed. After arriving at the best possible support contract with the commander, the project officer is left with the job of negotiating his way through the project.

Two of the quickest ways to run into trouble are to go off on a tangent (and get wrapped around the proverbial axle) and to turn a blind eye to command-suggested changes in scope. Many small changes may come up during the program that an engineer is tempted to accept without much thought. Be careful! Try not to add work without written authorization. Keep records of important communications and changes.

It is always important to keep in mind your rank and grade relationship with your commander. Try to remain objective and not let your enthusiasm damage your career. Always be tactful. When conducting your arguments with the commander and his staff, you can quickly reach the point of diminishing returns and possibly jeopadize your position.

A useful tactic related to me by a full colonel is the following one which he learned from a reasonably astute lieutenant general. When you reach the point where you are in doubt as to the benefits to be accrued by continuing to pursue a particular argument, stop and ask your boss, "Sir, is this topic still open for discussion or have you already arrived at your decision?" Hopefully, he will realize that whether he has made up his mind or not, he has nothing to lose by hearing you out and everything to gain. He will probably let you present your case. If he says he has alreay made up his mind, you may conclude that he has rightly and justly done so, or that he is just a dimwit acting without complete data. It all depends on the commander and the circumstances. Regardless of your opinion, you have the opportunity to stop here and accept his decision without endangering yourself or needlessly irritating him. *And,* once he has made his decision, *support it as if it were your own;* fall back and regroup for the next topic to be discussed. This way you'll be more likely to negotiate the hazardous path of project support.

• MOTIVATION.

Motivate means to provide with a motive. Motive, in this case, implies an emotion operating on the will and causing action. And, according to Webster, it is synonymous with incentive, inducement, spur, and goad. But if a project officer tries to motivate his team by putting these synonyms into practice, he's asking for trouble. Many officers consider themselves leaders as a result of their commission and fail to note that it may be only their rank and authority that serve as incentive and inducement; this smacks of blackmail. Spur and goad reek of downright arm-twisting — the worst possible negative motivation. Inducements and goals don't really instill motivation; they only force movement. Movement is most noticeable when people are hard at work; and let's face it, this is a prerequisite for the successful completion of any job. *But*, work will soon become a drudgery if it isn't challenging. This is what motivation is all about. In the situation of leadership without force or coercion, you must insure that a man has job enhancement or job fulfillment for him to develop the right attitude and put out that needed extra effort.

Job fulfillment is achieved by giving a man tasks commensurate with his skills or by increasing his responsibility. To illustrate: the project officer should delegate authority for liaison with command and support elements to task leaders who have completion responsibilities.

Despite all the Army's preoccupation with leaders and theories about motivation, the best motivators are people who understand their fellow men and who follow their native instinct in dealing with them. A few things to try are:

A. Maintain your positive attitude. Let everyone know there's a solution to every problem.

B. Don't get involved in discussions that criticize superiors, adjacent groups or leaders, subordinates, or anyone for that matter. It's bad for morale.

C. Don't make promises that can't be kept.

D. Give each key man the attention he requires. Some people prefer to be left alone to do their work. Others need to communicate often, even when they are on top of their job. It's in the project officer's best interests to size up the individuals working for him and give them the time required.

E. Develop your subordinates. Help people organize themselves and increase their own output. Don't criticize or condemn if you can teach instead. A simplified example: a small boy at a scout camp was staggering back from the water pump with a full bucket of water. He spilled most of it as he walked. His scout master poured half the water into another bucket and sent the lad off with two half-filled buckets. Soon the boy could carry two buckets, three-quarters full. The "leader" had increased the boy's output by 100 percent and had given him a feeling of accomplishment.

In summary, it is apparent that the project officer's position cannot be taken lightly. He must establish and maintain a dialogue with all the people working on his program. He must see that the work is accomplished on time and within resources; he must arrive at an understanding with the commander as to mission priority, support required, and project feasibility; and he must provide the motivation to make all this happen.

In short, he must have the ability to communicate, regulate, negotiate, and motivate, for program management is an exacting science that should be mastered and practiced until it is honed to the state of the fine art.

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A Thrifty Approach to Management

LTC David G. Cotts
MAJ Robert L. Oliver

The dream of every commander is to obtain willing and maximum output toward defined goals from each member of his unit. Needless to say, this is easier said than done. Personal supervision of the myriad of tasks required of a commander above platoon level can be overwhelming and can detract from the other functions of command. A new approach to command, from the book of the behavioral scientist, shows promise to bring the commander's dream closer to reality. Management by objective (MBO) appears to have the potential to significantly improve the performance and overall contribution of members to an organization. This article relates the experiences of the 249th Engineer Combat Battalion (Heavy) with the type of MBO program during CY 1975. This was the first known MBO program tried at battalion level within the US Army, Europe. This article concentrates on the battalion level experience; however, the lessons learned in the 249th can assist the brigade/group or company commanders as well. While expectations exceeded results in some respects, many lessons were learned and the overall positive results make this approach well worth considering for any troop unit.

The basic concepts of MBO can be applied to any element from the individual soldier to the Theater Army. Although many variations are possible, MBO generally consists of a system of objective identification, quantification and periodic appraisal. For best results, those responsible for objective achievement (company commanders in a battalion program) should also have a say in objective establishment. Enhanced motivation by the soldier or subordinate commander should result from reduced anxiety by knowing clearly what is expected and where he stands and from the substitution of self-actuation and self-control for control and stimulation imposed from above.

It is easy for us in the military to accept the principle of the objective as overriding. Every organization should have objectives and its primary efforts should relate to them. The problem is that there are so many important goals, objectives, and programs in the Army today with high level or command interest, that the small unit commander can become confused without a consolidated program to assist and guide him. This single purpose makes MBO an option to be considered. In addition to this one-step source of relatively stable guidance, other purposes of the 249th MBO program were to broaden and re-direct the thrust of the battalion driven by a TOE change from Construction to Combat Heavy, to focus on a new commander's desires, to trigger response at lower echelons, to provide a means for self-evaluation and to provide a vehicle and semi-fixed format for the conduct of the inevitable briefings. In addition, it was fully expected that additional benefits of a comprehensive MBO program could

be decentralized execution of various progams, enhancement of NCO professionalism, improved staff inspection, assistance and evaluation, motivation of all supervisors to a higher level of meaningful activity and, in general, improved performance of the battalion.

Following the classic military planning cycle, our MBO program started with the commander's guidance. However, due to the originality of the program and late start (the end of January), the guidance took the form of a positive statement from the commander, "These are our objectives for CY 1975." This necessary step was neither pure MBO nor was it classically military. Some of the results of this concession to time are discussed later in this article.

Formulation of the MBO program continued with a staff estimate of appropriate content in the various functional areas. Key input was derived from current higher headquarters guidance and programs, TOE missions, the most recent inspection emphasis (such as the AGI), the desires of the commander and an attempt to guess what would be "hot" in USAREUR and the Army in the upcoming year. This latter input required an "ear to the ground" and a crystal ball. Its importance cannot be overemphasized. The initial tendency was toward philosophy and non-definitive generalizations. Eventually, specific desired results were isolated and quantified.

Several challenges in the construction of a MBO program were encountered. Grouping and categorizing goals and objectives is an area where a balance had to be struck between having too many and having too few. Although a minimum of two groupings, such as personnel readiness/equipment readiness, could have been possible, breakdown to a level to facilitate quantification and measurement was the determining factor. A second challenge was the appropriate quantification of each objective. Several kinds of quantification were attempted to make the 249th program as objective as possible and to minimize unmeasured subjective opinions from entering into the appraisals. Pure statistics were the preferred method and numbered thirty-six. "Go-no go" quantification was aimed at a determination as to whether something happened or not, such as on-time project completion. A third method of quantification was by percent of items rated satisfactory on a detailed checklist which was developed for each goal. This expanded quantification definition was necessary for each goal if important non-statistical functions were to be given emphasis and if the program was to be at all comprehensive.

The actual program consisted of thirteen objectives (Figure 1) which were further divided into forty-two sub-objectives, or goals, with appropriate yardsticks to measure progress toward established standards. Each objective was assigned to a proponent staff section and checklists were prepared for each goal to facilitate inspection and evaluation. Figure 2 shows the form and content of one objective.

Alcohol/drug abuse prevention
Contingency training/readiness
Equal opportunity for all soldiers
General educational development
Improve performance of chain of command
Improve quality of life
Maintenance
Maximize personnel/equipment utilization
MOS improvement and match
Physical readiness
Quality construction
Resource conservation
Safety

Two last items on program construction should be mentioned. As indicated earlier, a basic principle in MBO literature is that objectives are jointly determined by a subordinate and his supervisor. This was not possible when our program commenced. Our next higher headquarters did not use MBO; we had no time to consult with company commanders. A second principle is that priorities placed on objectives allowed the most important things to get done first or best. These principles became victims of the volume and detailed nature of mandatory activities established by higher headquarters and broad command interest in all things being done well. While some of these new requirements could be absorbed as a part of an existing objective, others prevented adherence to these principles. When the commander did not hold the line, his objectives just added to the already heavy burden of his subordinates.

As an added feature to our MBO program, the best company of the quarter competition was initiated to reinforce, focus attention on, and lend added motivation toward the battalion's objectives. A quarterly evaluation of all objectives was instituted to appraise progress and to be the basis for selection of the best company. Final selection was based on briefings given to the battalion command group (commander, executive officer, command sergeant major) by each company covering all objectives and by the proponent staff sections on their assigned objectives. The company briefing was an opportunity to show and tell what had been and is being done to achieve the goals and objectives. A great deal of imagination was seen in these briefings. They varied from a one-man monologue to a presentation by each key company NCO and officer with tours of various company areas. The staff briefing was informal, but fact-filled and covered each objective by company to include checklist results, statistics, and an appraisal as to the absolute and relative standing of each company. An adjectival overall appraisal of the battalion's progress in each objective was also required from each proponent at each quarterly briefing.

After four iterations of quarterly evaluations described above and several midcourse refinements, the results of the program can be tentatively judged. The evaluative function has been accomplished extremely well. A glaring searchlight has been put on every facet of the battalion's activities. The battalion and company commanders know where they stand, what progress has been made and where emphasis/attention is needed. Although progress toward most objectives has been steady and improving, in retrospect, progress toward thirteen objectives was too ambitious. Staff assistance was systematized and related directly to battalion objectives. Wholesome competition among the officers and NCOs was clearly developed by objective evaluation leading directly to selection of a best company. Quantification was a success in that remarkably few disagreements occurred between raters and ratees.

In response to a questionaire on the impact on their activities, the primary implementors (battalion staff and company commanders) agreed generally that the MBO program made clear what needed doing but still allowed some flexibility and managerial freedom. They agreed also that the progam guided their efforts more near the end of a quarter before an evaluation rather than continu-

Goals	Yardsticks	Methods and Target Standards
Project Management	Briefing	Confident, comprehensive.
	Organization	Layout, NCOs present and in key positions, tasks by unit.
	Materials status	No holdups, corrective action to obtain.
	Policy letters	Present and complete-group and battalion.
	Productivity	Daily goals, control, efficiency.
	Hand tools	Secure, maintained, accounted for, inventoried once per month.
High Quality Work	Plans and specs vs actual work	Professional, commercial finish type work. No discrepancies. Quality control plan comprehensive and followed, periodic classes. Supervisors technically knowledgeable.
	Protective measures and police	Protect finished work; clean as you go.
	Drainage	Effective before, during, after; no water delays.
	Testing	Tests conducted at proper times with specs met or exceeded.
Timely Accomplishment	EDCs met	No project extensions requested. All contingencies planned for.
	Scheduled vs actual progress status	All projects on or ahead of schedule, work proceeding on critical path.
	WCPRs	90% submitted prior to established deadline with no errors.
	Project completion reports	All documentation submitted within 30 days after project turnover.

ously. They felt that NCO professionalism and supervisor motivation were enhanced but not to the degree desired. Responses from company commanders were mixed on whether the program became their primary management tool, increased their ability to plan, improved communication, focused or scattered efforts, was used as a whip or was imposed too much from above. Established standards were, in some cases, felt to be unrealistic and unattainable although logical and relevant. In some cases, these were standards developed at DA/USAREUR level. There were also mixed feelings on how much commanders could influence progress in some areas and the effectiveness of the program in these areas.

Improved motivation of the entire chain-of-command by MBO did not occur to the degree envisioned. Reasons for this probably were that subordinates did not have much input as to what their own appropriate and realistic objectives should be. Some appeared overwhelmed by the comprehensive listing of prescribed duties and responsibilities. The company commander especially felt the concentrated nature of the program. His position was like being at the neck of a funnel. It appeared to him that many levels of high-powered talent were continuously at work above him, while Murphy's Law was hard at work below him. Although simplification of the MBO program might be indicated, no company commander could recommend any item to eliminate or change.

As might be expected, periodic crises and priority drives detracted noticeably from the MBO program. Hopefully this will be reduced when MBO is practiced at other levels, especially those above the battalion. The commander must honestly keep his pact with his subordinates and should not apply direct or subtle pressure outside his stated objectives. Responsiveness was not impeded however, since the program was so comprehensive and few areas were not already covered.

As with any new program and particularly one which attempts to provide the entire management guidance for a battalion, bugs needed to be worked out. Format, as well as content, changed several times. Subordinates tended to react rather than act as changes occurred and, until the end of the year, never really had the chance to implement MBO at their levels. An associated problem was the need for an extensive sales effort to educate and gain acceptance of any new program prior to implementation. This is particularly true of MBO. Ideally the entire chain-of-command, down to the first line supervisor level, practices MBO on the job daily. A great deal of inertia had to be overcome to reach that ideal situation.

In summary, the MBO was most effective as an evaluative tool with significant value as a motivator when intimately tied to an award. Although primarily dictated from above, the 249th program provided a very definitive basis for a company commander to decentralize and establish his own MBO program. Briefings revolving around this program, given at company and battalion level to visiting VIPs, were very well received. Documentation of the program also facilitated submission of the Sturgis and Itschner Award nominees from the battalion.

Engineers are sometimes accused of trying to reduce any activity to a quantitative formula, program or punch list. Hopefully MBO will not result in reduction of unit management to a rigidly quantitative model, but it does appear to be a valuable tool that can go a long way toward reducing ambiguities, false starts, wheel spinning, wild occillations and guess work. The 249th program is offered for consideration as a comprehensive attempt at getting a handle on and doing many things well. It is one way, but certainly not the only way. However, the proliferation of objective listings by headquarters within USAREUR in the latter half of CY 75 indicated that MBO has arrived at least for the near future. It behooves commanders and those who wish to command to understand MBO and to be prepared to implement it with wisdom and judgment.

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Major Robert L. Oliver graduated from the US Military Academy in 1961. He holds an MS in civil engineering from Kansas University and has successfully completed the Engineer Officer Advance Course. His assignments include service as an engineer platoon leader and company commander in USAREUR, an instructor in the Department of Engineering and Military Science at Fort Belvoir, tactical officer at the United States Military Academy, MACV advisor in J46 EAD, and S3 and executive officer of the 249th Engineer Combat Battalion.

WES

Busy as a Beaver

LTC Robert K. Hughes

The U. S. Army Engineer Waterways Experiment Station (WES) at Vicksburg, Mississippi, is the oldest, largest, and most diverse of the Corps of Engineers' research and development activities. Organized in 1929 as an experimental hydraulics laboratory, WES devoted the first ten years of its existence to solving civil-oriented problems related to flood control. With the advent of World War II, the WES mission began to evolve to one of conceiving, planning, and executing engineering investigations and research and development studies in support of both the civil and military missions of the Chief of Engineers and other Federal agencies. WES now operates a complex of laboratories in the fields of hydraulics, soil mechanics, concrete, engineering geology, pavements, expedient construction, nuclear and con-

ventional weapons effects, mobility, and environmental systems and effects.

WES's first venture into military-related projects was in 1939 when war clouds began to gather over Europe. The model shop at WES was called upon to construct 100 sets of pontoon bridge models for use at training centers around the U. S. to teach young military engineers the techniques of float bridge construction. For the next six years WES efforts were devoted almost entirely to war-related activities. Projects included a study of the stability of artificial harbor breakwaters designed and constructed for the Normandy invasion; testing of airfield landing mats; mobility of military vehicles in jungles, beaches, and rice paddies; and design of flexible airfield pavements for the Air Corps.

WES participation in military engineering research and development continued to grow after World War II and by 1968, at the height of the Vietnam War, approximately 68 percent of the total WES effort was directed toward the solution of military-related problems. Effects of nuclear and conventional weapons on strategic and tactical structures; design of harbors in Vietnam; the detection, location, and destruction of Viet Cong tunnels; the geographic location of construction materials in the Mekong Delta; the design of protective shelters and fighting bunkers; the design and procurement of landing mat and membrane; dust control techniques; lime stabilization of soil; etc.; are just a few of the areas related to military engineering which have been studied by WES engineers.

Today, the total reimbursable work load at WES is $56 million annually. Of this total program, approximately 49 percent is military funded. In addition to research for the Chief of Engineers, the FY 76 program includes work for the Defense Nuclear Agency, Army Materiel Development and Readiness Command, Training and Doctrine Command, U. S. Navy and Air Force, NASA, Defense Civil Preparedness Agency, and many others. To accomplish this work load WES has a staff of 1478 employees, of which 487 are professional engineers and scientists. In addition to the civilian staff, there are 27 officers and 10 enlisted men, all of whom have degrees in engineering or the physical sciences, and most of whom have advanced degrees.

Presently, there are numerous R and D efforts ongoing at WES directed at solving problems of the combat engineer in the Theater of Operations. Remember the dust problems in Vietnam during the dry season? Or the roads which became impassable during the monsoon? And the sensors used in perimeter defense and RPG screens around observation towers? These are just a few of the areas in which WES scientists and engineers are working to develop new techniques and materials to assist the combat engineer in performing his mission in a more efficient and effective manner.

There are several research studies under way to develop data and methodology for the design and evaluation of field fortifications and protective structures to defeat the effects of conventional weapons. To-date, equations have been developed

and verified in field tests relating cover depth, structural strength, and safe charge size for timber bunkers covered with earth. The influence of burster, shock-absorbing, and crater-arresting layers in various soil cover materials has also been determined. Sometime this year, WES will publish a family of curves which, with a simple equation, will provide the engineer in the field with a quick "bridge card" evaluation of the protection afforded by a particular bunker and will assist in designing bunkers from timber to defeat a specified threat. In addition to horizontal triggering screens and burster layers, criteria for the use of vertical screens to defeat direct-fire HEAT rounds are presently being developed. These studies are examining the relationships between the threat, the type of triggering screen, the standoff distance, and bunker design and construction.

During FY 75 a research project was initiated to developed design methods and criteria for unique metal-framed, fabric-covered underground protective shelters for use in the Theater of Operations for housing command and control functions, communications equipment, aid stations, or ammunition storage. These shelters are lightweight, easily transportable, can be installed without special equipment or personnel, and are expandable to meet desired size requirements. A method has been developed to analyze the structural behavior of the fabric material when used as a covering for the underground shelter. A finite elements structural analysis computer program has been used to analyze various frames for supporting the fabric covering. Laboratory tests to verify analysis methods and to evaluate a framed shelter in soil have been conducted. Conventional weapons proof tests were conducted

on one of the shelter designs at Fort Polk, Louisiana, in May 1976, and a prototype shelter concept will be tested in DICE THROW II, a high-explosives field test scheduled for White Sands Missile Range in October 1976.

Surveys of field fortifications used in Vietnam indicated a need for a fighting-hole cover that could be handled and installed by nonengineer troops and provide a means of decreasing the vulnerability of key fighting positions. With this as the objective, a corrugated metal fighting-hole cover shell has been developed. The concept of this shell is almost identical with that suggested by GEN Frank Camm during his assignment in Vietnam in 1968. The shell is made from four identical circular curved arch sections that, when connected, form a square base. The shell can be delivered by helicopter or truck and can be field erected using hand tools in 18 to 23 man-hours, including excavation of the fighting hole. The assembled shell is nestable and weighs 300 pounds. The reinforced concrete parapet structure of the same size weights 6800 pounds. When covered with 2½ feet of dry sand, the shelter withstood the effects of direct contact bursts of medium mortars and artillery rounds.

In the not-too-distant future, the manufacture of military dynamite will be discontinued. Industry is using bulk explosives that are safer, cheaper, more effective, and easier to use than our present military explosives. WES has a program, Military Engineering Applications of Commercial Explosives, called the MEACE program, in which the use of bulk explosives for military construction problems such as quarrying, excavation, and crater barriers is being investigated. Engineers are also looking at the use of bulk explosives as an expedient structural demolition for use against tactical structural targets such as bridges, field fortifications, and others.

To date, a slurry-type blasting agent has been demonstrated to be an effective demolition charge when applied against steel, concrete, and wood targets. Current investigations are attempting to establish effectiveness factors as in FM 5-25 for slurry blasting agents. Establishing the minimum quantity of explosive, the best container, and the best boosting technique requires considerable attention due to the nature of slurries.

The bridge in photo 1 was destroyed by four men in 15 minutes with six 60-lb slurry charges. Charges were attached to the truss and the bottom chord. No access to the underside was necessary.

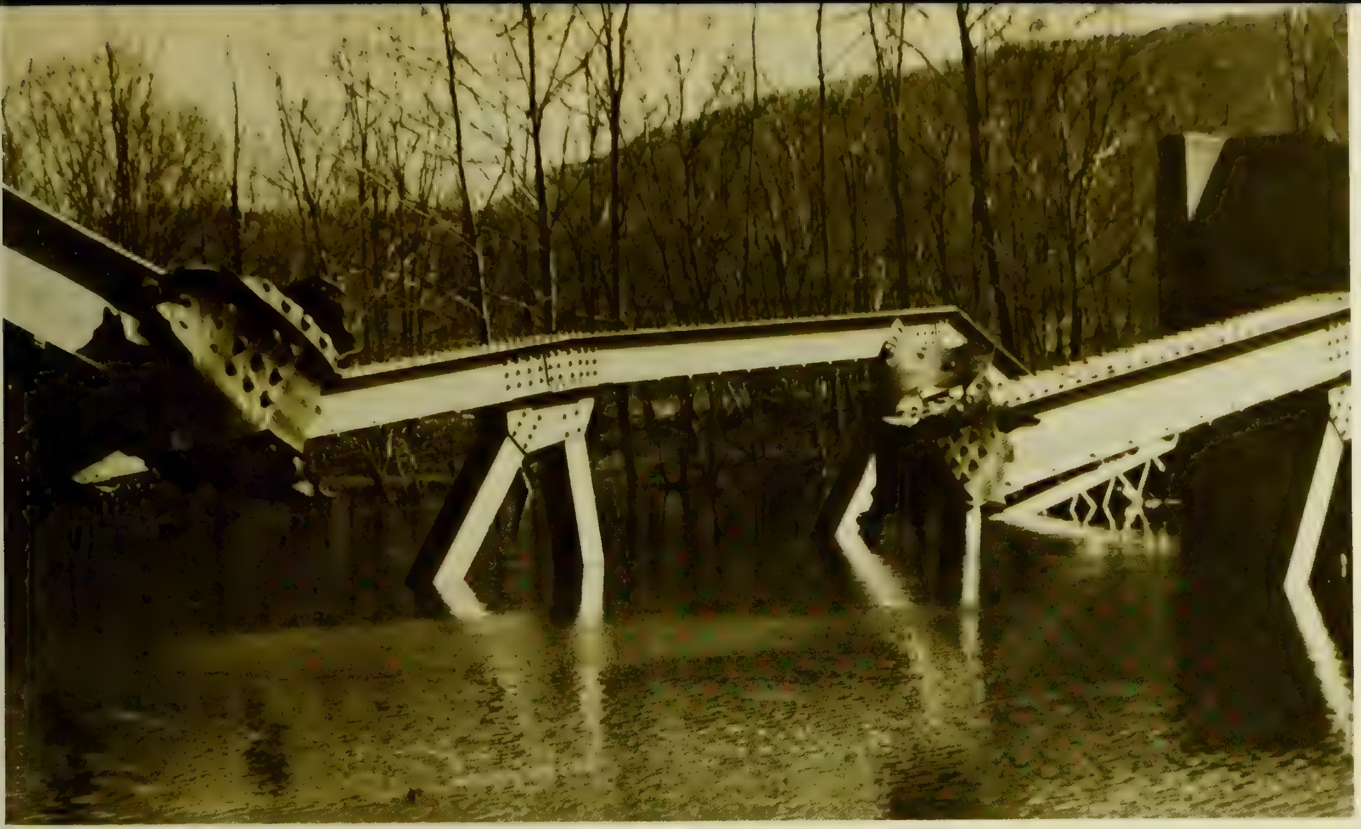
A new concept for the creation of crater-type obstacles was tested for the first time during FY 75. This concept envisions the creation of double-row craters through the placement of two widely spaced rows of cratering charges. This technique is especially applicable in sandy soils. Initial experimental results indicate that such craters not only present effective obstacles, but can be emplaced using significantly less explosives than those required for comparatively effective single-row design (40% to 50% less explosives). Although more emplacement holes are required, these holes are smaller in diameter than for the single-row crater to keep within the capabilities of equipment usually found with Engineer units in the field. Mobility tests showed that the M60 tank was able to negotiate the first crater encountered; however, when the tank entered the second crater at the high angle created by the center ridge, its progress was completely stymied.

Effective employment of atomic demolition munitions and conventional explosives for barrier/denial operations is impaired by the absence of accurate cratering, target response, and collateral effects data. This results in "over-kill" in yield selection and much greater safety requirements than actually necessary. We must also rely on an ADM stockpile developed with outdated technology. WES research in this area is concentrated heavily in a series of experiments funded jointly by OCE and the Defense Nuclear Agency. This series of experiments is designated as "Effects of Subsurface Explosives," or ESSEX.

Seven different areas are being investigated under the ESSEX program:

- I Cratering phenomenology, effects, and barrier assessment
- II Dams
- III Bridges
- IV Tunnels
- V Hardened and nonhardened structures
- VI Airfield and railway systems
- VII Ports and inland waterways

In ESSEX I, among other things, a nuclear explosives simulation technique using gelled nitromethane as the explosive source was developed. WES also developed a fallout simulation technique using nonradioactive iridium and neu-



tron activation analysis.

Under ESSEX II it was confirmed that arch dams are vulnerable to water-shock loadings from low-yield nuclear explosions. These experiments were conducted on a 1:24-scale model of the North Fork Dam on the American River in California.

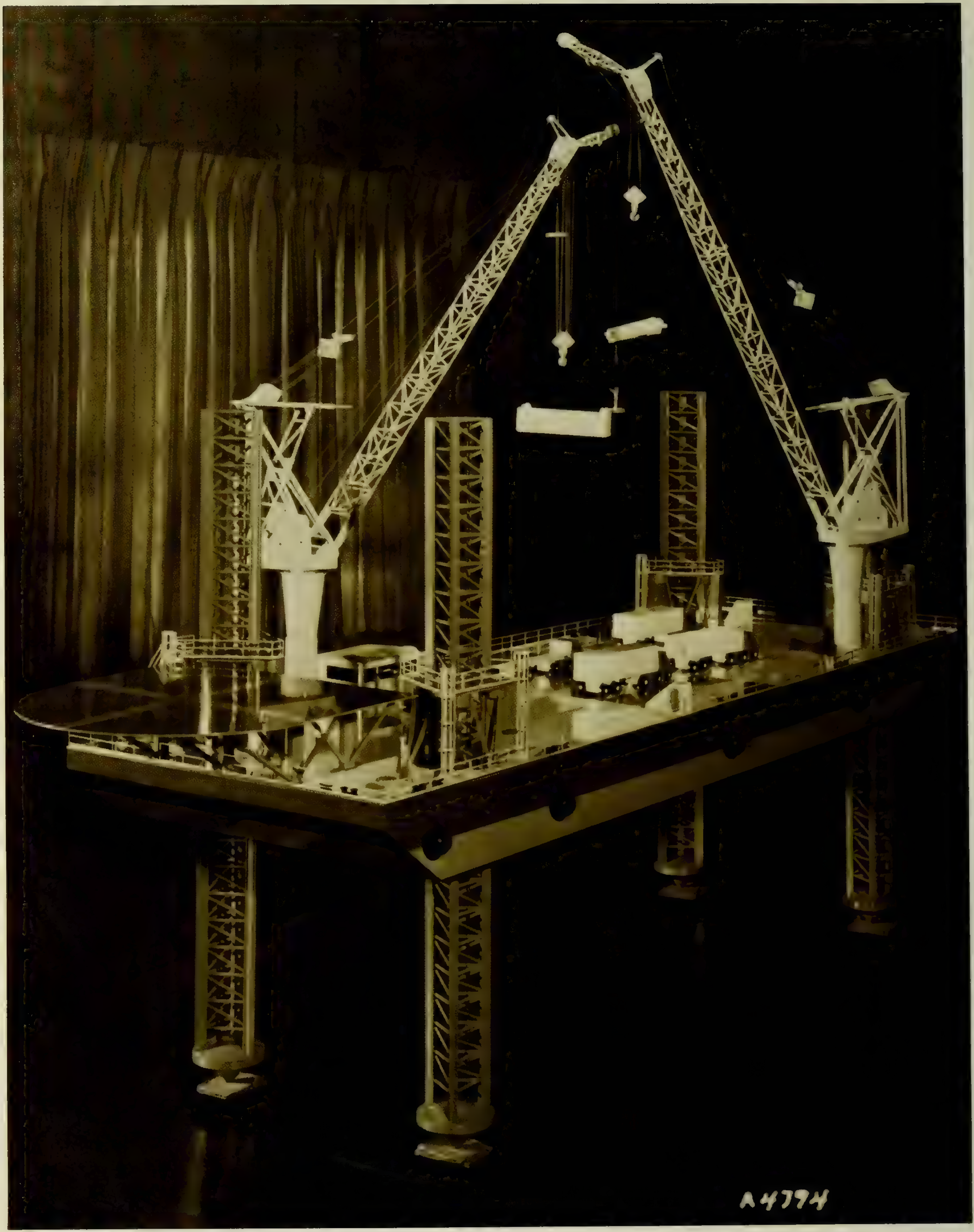
A series of experiments was conducted at Fort Polk, Louisiana, over the past two years to determine the degree of runway damage resulting from a subsurface detonation of an ADM or earth-penetrating weapon (EPW) as a function of warhead yield, burst depth, and runway geology. The results show that for a warhead detonated at near optimum depth, the area of runway destroyed by displacement of the ground around the crater alone is almost four times that originally expected.

The objective of the ESSEX V field test, conducted in October 1975 at Fort Polk, was to investigate the effectiveness of a low-yield earth-penetrating weapon against a class of generic structural targets. Ten tons of high explosives detonated at a depth of 6 meters below the ground surface were used to simulate a 1-kt EPW detonating at 22 meters. Eleven structural models consisting of bridge elements, aircraft shelters, a POL storage tank and pipeline, and hardened command, control, and communication structures were placed at various ranges from ground zero. In addition to damage from the force of the detonation, data were also collected on relative ground motion and ejecta fallback. The test provided significant information on the damage mechanisms and failure modes for certain types of structural targets.

Tests have recently been initiated in the ESSEX IV program to study damage of tunnels and hardened facilities in rock from low-yield nuclear explosions. An objective of the study is to determine effects of yield, burst position, and rock properties on cavity damage. To-date, tests have been conducted on models to collect data on such variables as material strength, standoff distance, depth of burial, and tunnel and weapon size.

Final results of the ESSEX program will be incorporated into appropriate Army manuals to aid in employment of nuclear weapons and in defining requirements of earth penetrators for attacking hardened targets. The data being developed will help in determining the minimum yield and best placement necessary to accomplish the mission and at the same time minimize collateral effects.

The ability of the U. S. Army to project ground forces onto a foreign land mass and sustain them logistically is limited by the ability to transfer heavy tonnages of containerized supplies and other material from seaborne surface transport to land-based transportation. Development of concepts, doctrine, and hardware in this area recently has concentrated on over-the-beach and logistics over the shore (LOTS) systems. While these developments were necessary and have resulted in effective logistics systems to support assault forces, they are expensive for sustained operations and must be replaced by semipermanent container port facilities early in the operation. Design criteria for constructing military container ports within reasonable time periods (by D + 90) which



are capable of accommodating the heavy loads (1000-psf uniform live loads and very heavy concentrated off-loading crane loads) imposed by modern container operations are needed. The need for new design concepts resulted in TRADOC funding a container port construction (PORCON) study at WES. To-date, this study has produced:

- Design concepts for an 80- by 900-ft container pier consisting of three self-propelled, 80- by 300-ft, prefabricated, speed-type, steel barge pier units, each mounted with two pedestal-supported 3500 ft-ton electrical off-loading cranes, which are capable of erection (jacked up) and full operation as container handling facilities within 2 to 3 hours after the individual units arrive at the Theater of Operations.
- A preliminary design for container storage and marshalling area.
- A suggested plan for using the individual self-propelled units as lighters if this should become desirable or necessary.

WES is currently engaged in the design of a lightweight general-purpose panel which will have multiple usage in various military applications other than airfield surfacings. The proposed usage will range from surfacing for vehicular roadway traffic to flooring for pedestrians and field hospital equipment. It is also envisioned that the multiple-purpose panel will be used in vertical construction as siding, roofing, and support columns. The main purpose for acquiring this type of panel is to eliminate the diversion of the heavier and more expensive airfield landing mats that have been used for such applications in the past.

In many instances, the construction of tactical bridges is greatly affected by the construction of their approaches. As rivers often flow through low-lying areas which are subject to flooding, bridge approaches often cross floodplains, swamps, or mud flats. Often the time required to construct approaches is the controlling factor in the selection of a bridge site, and this may not be the most desirable site from the tactical viewpoint.

The construction of bridge approaches over soft ground requires a great deal of manpower, construction materials, time, and money. The major problem is that the construction materials used in the foundation keep sinking into the soft ground or allow the soil to penetrate the construction material.

WES is currently performing a study to develop criteria necessary to provide rapid construction techniques and material requirements for approach roads from a bridge, across extremely soft ground, to the nearest existing roadnet. To-date investigations have included the use of plastic and wire construction fabrics and sand confinement concepts. Additional studies are scheduled along with field tests to develop other material requirements.

Research has shown that an explosive detonated beneath the water surface will generate a water plume whose demolition potential far exceeds that of the explosive itself. The use of the explosive-produced water plume as a means of bridge demolition is being studied in a series of laboratory tests and field tests on prototype bridges.

Water plume tests have been conducted on three obsolete prototype bridges. Two water plume shots were fired against a concrete deck bridge near West Point, Georgia. Two steel truss bridges in the Raystown Lake near Huntington, Pennsylvania, were also tested. Tests are continuing to determine quantitatively the forces developed in a water plume as functions of charge yield and geometry and to devise protection schemes to mitigate the forces in a plume that produce damage to bridges.

At WES the matter of technology transfer, getting new developments to the field users, is of primary concern. Progress on each of the projects mentioned above is reported periodically to the sponsor by letter report. At the conclusion of the project, a final report is prepared and disseminated Army-wide as well as to other interested agencies such as Defense Nuclear Agency, U.S. Air Force, etc. Simultaneously, information is provided to the Office, Chief of Engineers, for inclusion of new developments in appropriate field and technical manuals.

LTC Hughes graduated from The Citadel in 1958 with a BS in civil engineering. He is a graduate of the Engineer Officer Basic and Advanced Courses at Ft. Belvoir, Va, and the US Army Command and General Staff College at Ft. Leavenworth, KS. LTC Hughes also received his Masters and Doctorate degrees in civil engineering from Oklahoma State University. He has served in Europe, Greenland, Indonesia, Vietnam and CONUS. LTC Hughes has been the Deputy Director of WES since December, 1973.

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Engineer Assignments, LTC Tom Sands	325-7871
LTC Division: (DAPC-OPL-AS)	
Engineer Assignments, LTC Henry Covington	325-0423
Majors Division: (DAPC-OPM-AS)	
Engineer Assignments, MAJ Gary E. Woodham	325-8109
Combat Support Arms Division (Company Grade): (DAPC-OPF-E)	
Engineer Branch Chief, LTC Norman Kuklinski	325-0650
CPT Assignments, MAJ James E. Corbin	325-0651
LT Assignments, CPT Michael R. Foster	325-7426
Professional Development/ Personnel Actions, MAJ Roger Yankoupe	325-0621
Warrant Officers Division: (DAPC-OPW-AU)	
Engineer Assignments, CW4 Jean L. Derby	325-7837
Professional Development Division: (DAPC-OPP-P)	
Engineer Specialty Monitor, MAJ Tom Ostenberg	325-0250
Chief, Plans Branch, MAJ Galen Yanagihara	325-8152

GRADUATE SCHOOL NOTES:

GRADUATE CIVIL SCHOOL ACADEMIC DISCIPLINES. Regardless of program, Army sponsored graduate training is restricted to those disciplines in which the Army Educational Requirements Board has validated requirements and a "shortage" of qualified officers exists. Currently, for Engineer officers these disciplines are as listed below:

BUSINESS:

BAL	ORSA Analysist
BAM	Comptrollership
BAN	ADPS Business
BBF	Logistics Management
BBP	Procurement

ENGINEERING:

CCX	Civil Engineering
CFX	Aeronautical Engineering
CLX	Nuclear Effects Engineering
CEX	Chemical Engineering
CSX	Engineering Physics
CUC	ORSA Engineering
CUA	ADPS Engineering

POTPOURRI

PHYSICAL SCIENCE:

DEX	Geodetic Science
DED	Topography & Photogrammetry
DLX	Physics
DLD	Nuclear Physics

SOCIAL SCIENCE:

EBX	Foreign Area Studies

These Shortage Disciplines also support an alternate specialty in addition to Engineer.

GRADUATE SCHOOL OPPORTUNITIES IN FY 77. Input levels are anticipated to remain at levels similar to FY 75-76. We expect to input approximately 100-120 officers depending on requirements and officer availability

FULLY FUNDED ADVANCED DEGREE TRAINING (AR 621-1, CHAPTER 4). This is the principal program for obtaining a graduate degree and provides the primary means to train officers at the masters level. Application is made by forwarding DA Form 1618-R. An officer's application is automatically considered each time he becomes available for reassignment. The primary zone for consideration for schooling is 5 to 14 years service. An outstanding overall record of performance is necessary to be a contender for selection.

ADVANCED DEGREE PROGRAM FOR ROTC INSTRUCTOR DUTY (AR 621-101). ROTC inputs preceded by graduate training are being programmed ahead as far as the summer of 1979. Quotas will permit Engineers to enter graduate school in FY 77 with a follow-on ROTC assignment.

DEGREE COMPLETION PROGRAM (BOOTSTRAP) FOR GRADUATE DEGREE (AR 621-1, CH 8). Thinking about beginning a masters degree off-duty with a goal of obtaining a "Bootstrap" to finish degree requirements? Good plan, but be sure that the academic discipline is one which we can support. All participants must study in an academic descipline for which an AERB position exists and serve in a follow-on utilization assignment.

INPUT SCHEDULE. In order to insure your applications are received, processed, and evaluated the following schedule should be adhered to:

SCHOOL INPUT	CALENDAR APPLICATION DUE	SELECTIONS ANNOUNCED
JAN 77	1 JUL 76	15 AUG 76
JUN 77	1 NOV 76	15 JAN 77
SEP 77	1 FEB 77	15 MAR 77

ENGINEER

SELECTION CRITERIA. Officers must possess the following qualifications in order to be considered competitive for selection:

1. Be considered in the top third in comparison with contemporaries.
2. Be an Advanced Course Graduate.
3. Have successfully completed a company command tour.

UNDERGRADUATE SCHOOL NOTES

DEGREE COMPLETION PROGRAM (BOOTSTRAP) (AR 621-1, CH 8). Currently, we estimate that 30 officers will begin undergraduate training under this program in FY 77. The maximum period of training that can be supported is 18 months. Our objective is to support those officers with outstanding performance records in obtaining a bachelors degree in disciplines that the Army can use. These disciplines are too numerous to list, but undergraduate education directed in the areas where graduate level shortages exist get preferential consideration. See the disciplines previously listed.

SCHOOL INPUT	CALENDAR APPLICATION DUE	SELECTIONS ANNOUNCED
JAN 77	JUL 76	AUG 76
JUN 77	DEC 76	JAN 77
SEP 77	MAR 77	APR 77

MILITARY SCHOOLING NOTES:

Engineer Officer Advanced Course (EOAC) classes have been reduced in course length from 32 weeks to 26 weeks. Advanced Course Classes scheduled for FY 7T and FY 77 are as follows:

EOAC - 26 WEEKS

Class Number	Report	Close
1-7T	26 SEP 76	15 APR 77
1-77	6 FEB 77	11 AUG 77
2-77	5 JUN 77	13 DEC 77
3-77	18 SEP 77	7 APR 78

The FY 77 schedule for the 12 week long Engineer Officer Basic Course (EOBC) classes is as follows:

EOBC - 12 WEEKS

Class Number	Report	Brief	Close
1-7T	13 JUL 76	27 JUL 76	5 OCT 76
2-7T	10 AUG 76	24 AUG 76	4 NOV 76
3-7T	21 SEP 76	5 OCT 76	17 DEC 76

POTPOURRI

1-77	11 JAN 77	25 JAN 77	5 APR 77
2-77	1 FEB 77	15 FEB 77	26 APR 77
3-77	19 APR 77	3 MAY 77	13 JUL 77
4-77	14 JUN 77	28 JUN 77	7 SEP 77
5-77	16 AUG 77	30 AUG 77	10 NOV 77
6-77	13 SEP 77	27 SEP 77	9 DEC 77

PROFESSIONAL CHALLENGE:

Below are some thoughts that have been passed from hand to hand, officer to officer for years. The original author is unknown, but his thoughts will always be valid.

WHAT'S A LIEUTENANT?

To paraphrase Mark Twain, everybody talks about lieutenants but — you know the rest. It's time to restate a few convictions about these soldiers some of whom have a way of turning up a few years later as colonels and generals.

Let me tell you a thing or two about lieutenants. I claim to know something about what makes them tick. Lieutenants are good people, also officers and gentlemen. I am in no mood to listen to or to snicker at any more sorry jokes to the contrary. Lieutenants will continue to be officers and gentlemen just so long as we treat them and use them that way. If any of them are commissioned errand boys its because some commanders have made bad mistakes.

Lieutenants don't want to be coddled or babied into the Army. They're men and they want to be treated like men. They have the brains, education, aptitudes and attitudes that we established as prerequisites to their appointment. On our recommendation they now bear the President's commission.

Lieutenants trust us to give them direction and virile leadership. In return, they expect us to trust them.

Lieutenants are prepared to give us every courtesy that rank or position may demand. In return they expect from us the unfailing courtesy one gentleman owes another.

Lieutenants have a lot to learn. They want to learn. They'll provide the perspiration. They expect us to furnish the opportunity.

Lieutenants expect to acquire experience and maturity of professional judgement with the passage of time. They're willing to work hard to get them. They know that professional perception and judgement seldom come to errand boys. They want jobs that will test them to the upper limits of their capabilities, and they are willing to gamble their professional futures that they can do them well.

When they do something right they like to know it. When they goof, they expect to be instructed. When they get out of line — as we all do at one time or another — they expect to catch unshirted hell and are disappointed when we don't give it to them.

When they have a chewing out coming, they know it. They expect us to have the courtesy and the courage to make it a private session, eyeball to eyeball. When they respond properly to this treatment, there is no need to report the seance in their next efficiency report where it will be read by selection boards for the next 25 years.

Every old-timer worth his salt can remember one or two high spots in his career. Many of these came to pass because of the thoughtful, kindly and timely advice of some senior who believed in him and trusted him. This, I think — more than any other one thing — is what lieutenants hope for from their seniors.

Don't cry to me about retention rates. Money, while important, is only one part of the motivation. What happens to these officers in the field during their first tour of active duty will do more to shape their attitudes than a few extra bucks.

We talk — my God, how we talk! — about leadership. Sometimes I think all we want of lieutenants is their ears. There's more to leadership than the old "Gung Ho." One job of leadership is to translate the Army to its lieutenants, and to do it honestly, forcefully, credibly.

Officers that sound like apologists for their own professions are no help at all. The few who who do this must accept a share of the blame for the depressing results.

In seeking career officers for the Army, we do not ask for plaster saints. God Forbid! We want much more than beef, brawn, and physical courage. We seek intellect, heart, passion, imagination, and a little of the romanticism that persists in any man who is worth more than the pinch of powder it takes to blow him to hell. We seek men who live, laugh, work, play, love, fight, make mistakes, fall, and pick themselves up again. We seek men of character and color, who are clearly identifiable personalities in their own right. We seek men of moral fiber and personal integrity, whose given word is as good as money in the bank. We seek men who, by personal conviction, understand the mystique of commissioned status and believe passionately in the United States of America.

Seek them? We've got them! Look at your Lieutenants. Let's take them, trust them, and work their pants off. Let's quit talking, and show them what we know about this man's Army. If we do it well enough, we won't have to talk. Best of all, we will have helped a grand group of young men toward an understanding of the real meaning of career satisfaction.

Are you with me?

BRIDGING

OPMS Specialty Designators for YG 69 Officers

The Officer Personnel Management Directorate's (OPMD's) company grade career divisions have initiated file reviews to determine OPMS alternate specialty qualifications of all OPMD-managed officers in Year Group 1969 (YG 69). Some of the factors being considered include the time officers have served in various OPMS specialty areas, how well they performed in these specialty assignments, and their civilian and military education.

Final determination of alternate specialties — which each year are designated formally for all officers completing eight years' Active Federal Commissioned Service — is based on three criteria: Army needs, the individual officer's experience, and his or her personal preferences. Army requirements must be the primary consideration in making final designations.

Year Group 69 officers will have an opportunity to cite specialty preferences on personal questionnaires which OPMD will furnish through servicing Military Personnel Offices (MILPOs) during the month of May. When completed and returned through the MILPO to OPMD, each officer's specialty preferences will be compared with the results of the file reviews. OPMD's company grade career divisions then will make final designations for each officer.

The specialty designation process is more complex than most officers realize. The least complicated situation occurs when the company grade officer cites specialty preferences which correlate with his education, training and experience. If there is little or no correlation, OPMD must evaluate the officer's experience and preferences and make a judgment decision based on both Army requirements and individual preferences. If an officer's preferences are not supported by experience, the OPMD evaluator must also judge not only the officer's potential to complete the necessary training successfully, but also whether Army requirements for the specialty could be filled better by other captains with similar specialty preferences but who already have training and experience in the area. At the end of the process, we must have about the right number of officers in each specialty, based upon the best information available concerning projected requirements.

While OPMD career managers may have to designate some officers from YG 69 into OPMS specialties in which Army requirements exceed the number of officers who have indicated a preference for those specialties, OPMD's goal is to minimize the number of captains who will be designated specialties which they did not list in their preferences.

Designation of specialties for members of YG 1969 will be completed by 31 August 1976. Officers will be notified by personal letters routed through MILPO channels as soon as possible thereafter.

Special Instructions

FOR MILPOs. Detailed advanced planning for designation of alternate specialties for YG 69 officers has been provided in DA message DAPC-OPP-S 301400Z Mar 76. MILPOs are reminded that this specialty designation action applies only to OPMD-managed officers having at least 84 months' Active Federal Commissioned Service (AFCS) on 30 June 1976 and less than 96 months' AFCS on 1 July 1977. Commissioned officers of the Army Medical Department, the Judge Advocate General Corps and the Chaplain Corps are not affected.

FOR COMMANDERS. Since this action will have long range impact on the military career of the individual officer, commanders are encouraged to provide personal counseling for officers scheduled to participate in OPMS alternate specialty designations.

FOR OFFICERS IN YG 69. Officers should consult DA Pamphlet 600-3, **Officer Professional Development and Utilization**, for detailed information on OPMS specialties.

THE GAP

DA Suspends Waiver Promotions to E4

Due to FY 76 budgetary constraints, all waivers of time-in-service for promotion to E4 have been suspended until 1 July 1976. According to HQDA message DAPE-MPE-PS 051342Z Apr 76, commanders may promote only those E3s who have more than 24 months' TIS and who meet the remaining criteria specified in Chapter 7, AR 600-200. The message also explains that the suspension does not affect current policies governing student promotions or E4 advancements authorized either in valid enlistment contracts or under the Stripes for Skills Program.

TENTATIVE BOARD DATES FOR HQDA ENLISTED PROMOTION/SELECTION BOARDS

For information and field planning purposes, the Office of the Deputy Chief of Staff for Personnel has released the following schedule for senior enlisted promotion/selection boards:

BOARD	TENTATIVE DATES	LOCATION
Advanced NCOES	27 Apr 76-27 May 76	Fort Harrison
Command Sergeant Major	15 Jun 76-25 Jun 76	Fort Harrison
E8 Standby	14 Jul 76-15 Jul 76	MILPERCEN
USA Sergeant Major Academy	27 Jul 76- 6 Aug 76	Fort Harrison
E9	8 Sep 76-18 Sep 76	Fort Harrison
E7 Standby	6 Oct 76- 7 Oct 76	MILPERCEN
E8	27 Oct 76-17 Nov 76	Fort Harrison
E7	11 Jan 77-11 Feb 77	Fort Harrison
E9 Standby	1 Mar 77- 2 Mar 77	MILPERCEN
Advanced NCOES	8 Mar 77- 1 Apr 77	Fort Harrison

Early Submission of Reenlistment Applications

Too many soldiers wanting to reenlist are waiting too long before submitting their reenlistment applications.

While current policy prohibits reenlisting any soldier who has more than 90 days remaining on an enlistment contract, MILPERCEN's Enlisted Personnel Management Directorate (EPMD) is urging unit commanders to counsel prospective reenlistees — especially those classified in GROUP II under the Year Group Management Program (that is, soldiers who require waivers, who have MOS scores below 100, or who lack high school diplomas) — that reenlistment applications can be submitted as early as six months prior to ETS.

The additional three months' leadtime would give EPMD sufficient opportunity to review and process individual applications in order to notify soldiers of reenlistment approvals or denials at least 90 days before their ETS dates. Encouraging early submission of reenlistment applications also would benefit the unit commanders' local reenlistment programs by providing them a higher assurance of achieving their monthly reenlistment goals.

The Corps gets a Medal

Engineer Staff

The Army Corps of Engineers, designers and builders of Libby Dam (near Libby, Montana), the architect for the project, and the sculptor of the dam's Intenational Treaty Tower, received The National Sculpture Society's Henry Hering Memorial Medal in a New York City ceremony May 11th.

Brigadier General Walter O. Bachus, Director of Facilities Engineering, accepted the medal for the Corps of Engineers. Paul Theiry, Seattle architectural consultant, and Albert W. Wein, Scarborough, New York, sculptor, who won the international competition for design of the sculpture, also received the medal.

Making the presentation was Michael Lantz, a former president of the National Sculpture Society, and one of the judges for the Libby Dam sculpture competition.

The International Treaty Tower commemorates the agreement between the United States and Canada for the cooperative development of the Vast Columbia River Basin water resources. The dam, dedicated by President Ford last August, is on the Kootenai River in northwestern Montana.

Readership Survey

Engineer Staff

1. What is your age?

17 to 21 ____________
22 to 25 ____________
26 to 30 ____________
31 to 40 ____________
Over 40 ____________

2. Your Sex?

Female ____________
Male ____________

3. What is your relationship to the Army?

Active Army ____________
Army Reserve ____________
National Guard ____________
Retired ____________
DAC ____________
Dependent ____________

4. If military, what is your pay grade?

E1 to E3 ____________
E4 ____________
E5 to E7 ____________
E8 or E9 ____________
O1 to O3 ____________
O4 or O5 ____________
O6 and above ____________

5. How often do you read THE ENGINEER?

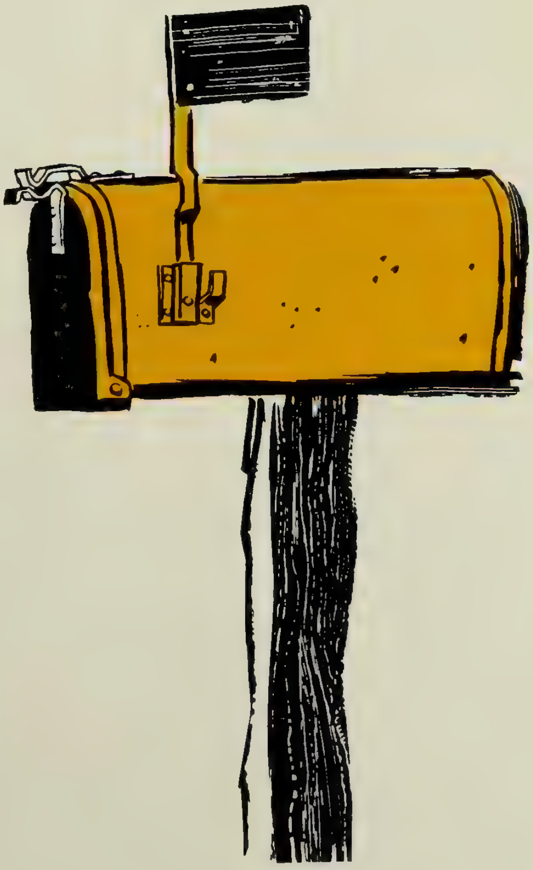
Rarely ____________
Regularly ____________
Every issue ____________

6. How would you rate distribution of THE ENGINEER at your installation unit?

Thorough ____________
Adequate ____________
Inadequate ____________

7. How would you rate the material contained in THE ENGINEER? Check whatever appropriate:

Entertaining ____________
Useful ____________
Believable ____________
Stimulating ____________
Well illustrated ____________
Well rounded ____________
Pointedly written ____________
Worthwhile ____________
Dry ____________
Irrelavent ____________
Questionable ____________
Boring ____________
Poorly illustrated ____________
Narrow in scope ____________
Verbose ____________
Superfluous ____________



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8. Would you like to see more or less articles by the following groups (if you're already satisfied, leave blank):

MORE		LESS
	Junior Enlisted	
	Junior NCO	
	Senior NCO	
	Junior Officer	
	Field Grade Officers	
	General Officers	

9. Would you like to see a pin-up girl or guy in THE ENGINEER?

Neither	
Pin-up girl	
Pin-up guy	
Both	

10. Do you have any comments, criticisms or suggestions for the magazine?

11. Can you name any articles which appeared in THE ENGINEER that particularly impressed you?

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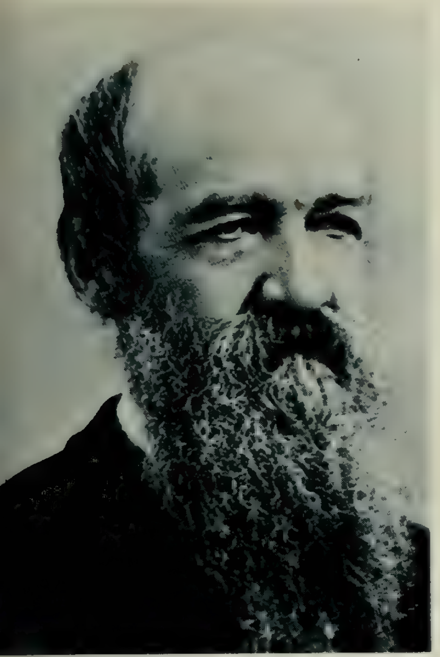

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CHIEF'S BRIEFS

Brigadier General James Chatham Duane was born in Schenectady, ew York, June 30, 1824. His grandfather was a member of the ontinental Congress. Duane was graduated from Union College in 844 and from West Point on July 1, 1848, when he was promoted to econd Lieutenant, Corps of Engineers.

From 1852 to 1854 Duane taught practical military engineering at est Point during the superintendency of Robert E. Lee. In 1858 he ed the celebrated 1100 mile march of "A" Company from West Point to tah. At President Lincoln's inauguration in 1861 Duane commanded he guard of select engineer troops. In 1862 Captain Duane built the irst military ponton bridge over the Potomac at Harpers Ferry.

From 1862 to 1865 Duane distinguished himself as Chief Engineer, rmy of the Potomac. His many achievements included construction of he longest (2200 feet) ponton bridge over the James River in eight ours in 1864.

Duane commanded Willet's Point, New York from 1865 to 1868. In anuary, 1867 Duane and Major Henry L. Abbot organized the ssayons Club, the beginning of the present U.S. Army Engineer chool.

Duane served two decades as Superintending Engineer of umerous Atlantic Coast defenses. He became a senior member of the oard of Engineers for Fortifications and River and Harbor Improvements.

Duane was appointed Chief of Engineers in 1886. After retirement n 1888 he served as Commissioner of the Croton Aqueduct, New York.

General Duane died December 8, 1897 in New York City.

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ABOUT OUR COVER

Sherman once said that war is hell. He couldn't have imagined the hell that it was to become some forty-odd years after the Civil War. World War I brought forth many vicious new forms of dealing death to humans on both sides. None, however, was more destructive than the use of poisonous gas. In this issue we tell of its use in our story, "Ypres-the Beginning of Gas Warfare." We also bring you a modern day approach to making sure you don't get caught like the troops in World War I. Read our other article "NBC Warfare" for some good advice on NBC training.

.PIPELINE. PIPE

Improved Camouflage Being Developed for M60A1 Tank

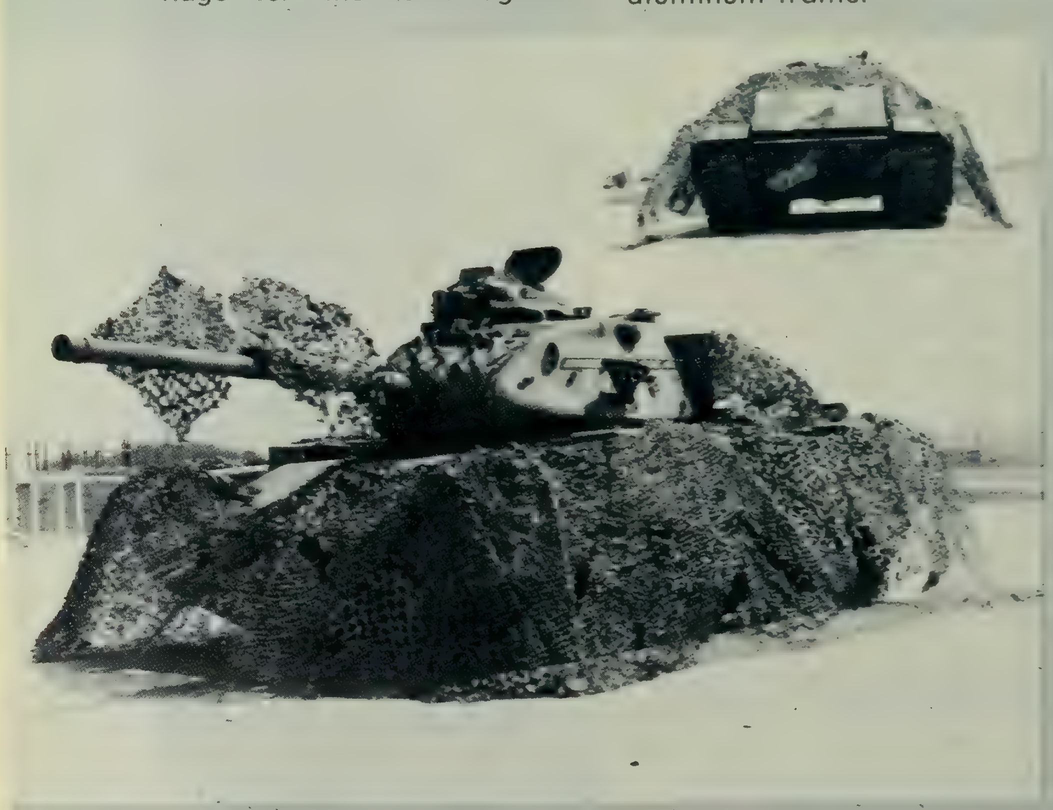
Improved camouflage for the M60A1 tank is being developed and tested by the US Army Mobility Equipment Research and Development Command (MERADCOM), Ft. Belvoir, VA to compensate for the increased capabilities of detection equipment and the improved accuracy of weapons.

Under the pilot program MERADCOM and the Tank Automotive Command (TACOM) are evaluating the camouflage of the M60A1 tank.

Last summer, the M60A1 was selected for an expedited pilot effort in camouflage. The program serves two purposes: first, it will provide camouflage for the tank against selected threats; and second, it will document a sample case so other developers may have an example to follow.

To prevent heat seeking missiles from "locking on" to the hot exhaust fumes from the tank's engine, an air foil was developed. The foil forces the exhaust up and out thus causing the heat to dissipate over a wider area, lowering the temperature and effectiveness of the heat seeking missiles employed against tanks.

Permanently mounted 6 foot fiberglass rods which fold out above the tracks in a matter of seconds support a special camouflage net. A camouflage disruptor is used to disguise the gun barrel. This disruptor, previously developed at MERADCOM, is a portion of a net mounted on a collapsible aluminum frame.



Twenty foliage brackets have been added to secure branches and supplement other techniques.

Prototype smoke launchers located on the turret are being evaluated at Edgewood Arsenal, Md. The smoke rockets are projected and exploded to form a rapid smoke screen, hiding the tank from the enemy.

TACOM developed special vision port filters for use inside the tank at night. These filters will allow the crew to look out and use lights inside the tank without being spotted by the enemy.

SLUFAE Mine Neutralizer Under Development by MERADCOM

A SLUFAE (Surface Launched Fuel Air Explosive) mine neutralizer is under development by the US Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA for use by combat engineers to breach defended enemy minefields in support of combined arms combat operations.

Now in the engineering design test phase, the system is showing great potential in initial tests against live 300-meter deep minefields at Fort A.P. Hill.

It consists of rocket propelled fuel air explosive (FAE) rounds fired into a minefield from a 30-tube armored launcher mounted on a tracked cargo carrier. The rounds impact in a linear pattern and form highly volatile liquid chemical aerosol clouds. Auto-

LINE. PIPELINE.

matic explosion of the clouds by delay detonators produce blast effects that detonate land mines to clear paths thru minefields. The rounds can be fired from the launcher singly or in ripples up to 30.

The SLUFAE is expected to provide a quick response, all weather day or night mine neutralizer operational from defilade or concealed positions at distances up to 1000 meters from the minefields. Completion of the development is scheduled for 1980.

Man's Best Friend Tested At MERADCOM

Man's best friend may prove to be a valuable companion on the battlefield. The US Army Mobility Equipment Research and Development Command (MERADCOM), at Ft. Belvoir, VA is testing the use of dogs for mine and booby trap detection.

At distances as great as 25 feet, a dog can detect a trip wire even though invisible to humans. The dogs' ability to detect metallic mines equals that of conventional metal mine detectors and exceeds it in the detection on non-metallic mines.

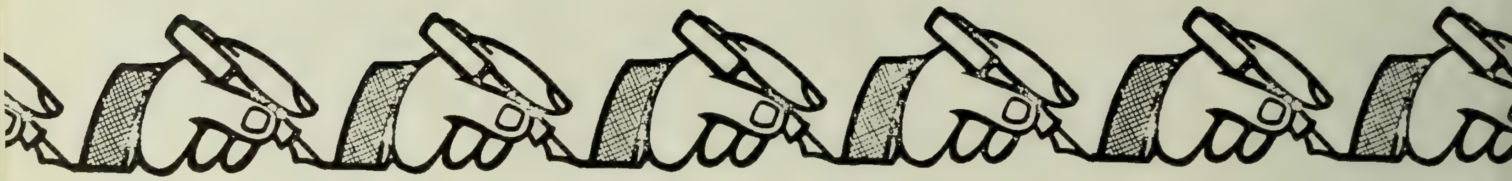
A research physicist in charge of the project at MERADCOM said "Dogs are remarkably proficient in the detection of booby trap wires, far excelling any other practical or even experimental devices now available."

The exact mechanism a dog uses to detect mines and booby traps is not completely understood. It is known that a dog's extraordinary sense of smell is a major factor. Also the dog's keen hearing may also be important and it is believed that they may actually hear the vibrations of the booby trap wire, trip wires.

The philosophy used during training is the principle of positive reinforcement, rewarding the canine with food tidbits and praise. The need for punishment is rare and used only for incidents such as fighting or attacking handlers.

Many of the same training techniques used for explosives and narcotic detection dogs were applied. German Shepherds and Labrador Retrivers of either sex undergo 8 months of booby trap and land mine detection training.

These dogs would be deployed with a handler for mine and booby trap clearing operations in support of ground troops. They could be used to mark mine fields, clear trails, roadways and helipads, and to search buildings, bridges, vehicles and even persons for explosive devices.



SIR

Everyone has been hearing of the UET for a long time. In 1965, while at the Engineer Agency, CDC, the UET seemed to be coming on the scene before 1970.

But if we go to war tomorrow, the D7 will be providing the support just as it did when the 1st Bde, 5th Division went out on the Khe San plain in 1969.

We need to keep up to date on new developments but perhaps publicity should be more restrained (and factual).

Most things "universal," do no one job very well. The UET can't be expected to be any different.

PHILLIP D. WEINERT
LTC, CE

SIR

In reference to MAJ Kish's article "Are Engineers Really Different," Fall 1975 issue of The Engineer. I question his article particularly so in that he proposes to get rid of support relationships as they are known in current doctrine and actual practice today. The support relationship rules as they are known today are:

I COMMAND RELATIONSHIPS

Organic Units
Assignment

Attachment
Operational Control

II SUPPORT RELATIONSHIPS

Direct Support
General Support

III WORK ASSIGNMENTS

Task Assignment
Area Assignment
  Forward Working Limit

Combination Assignment

He proposes to combine support relationships and work assignments together to form mission assignments. This cannot be done! You can change them, add or subtract to the list, but they cannot be removed.

He also states that Direct Support is currently a command relationship. This is in error. While it is admitted that this is not engineer doctrine, it is stated that this is Army doctrine IAW FM 101-5. The statement does exist in this manual, however, AR 310-25 correctly identifies the term "DS" as a support relationship and this is how it is used by "our combat arms brethren."

I admit that all the definitions as stated in the article are correct. It is unfortunate that what is a very simple system is misunderstood by many. For example, the two complicated charts presented can both be replaced by this chart:

COMMAND AND

STATUS[3]	COMMAND	LOGISTICS
ATTACHED SUPPORT	S	S[2]
OPCON	S	P
DIRECT SUPPORT	P	P
GENERAL SUPPORT	P	P

P = Parent Unit

S = Supported Unit

1 = Spare effort is rarely available under the DS arrangeme

The above chart has been extracted from the draft engineer how to fight manual. In general, the terms are in a hierarchy that goes from command relationship to support relationships to types of work assignments. The following example from the same draft clearly explains this:

Stop 16

COMMAND RELATIONSHIP

- The corps commander must decide if the corps engineers battalion will remain under the control of the corps engineer brigade to which it is assigned, or whether it will be placed under the control of another corps element through the use of a different command relationship. If he decides to attach the battalion to one of his divisions, then —

SUPPORT RELATIONSHIP

- The division commander must decide whether the battalion will be used in general support of the division as a whole, or whether it will be placed in direct support of one of the division's subordinate elements. If he decides to use it in general support, then —

T RELATIONSHIPS

ITY D BY	REQUESTS FOR ADDITIONAL EFFORT FORWARDED THROUGH	SPARE EFFORT AVAILABLE TO
	S	S
	S	S
	P	P[1]
	P	P

Parent unit remains responsible for personnel promotion and transfer actions

Parent Unit refers to Headquarters before attachment or OPCON

WORK ASSIGNMENT

- A further decision must be made whether to assign work to the battalion on an area basis, a task basis, or a combination of the two.

The last area of work assignments are the task/mission assignments that engineers need. We can alter them in any way we want. I doubt if they will ever be changed. We will always have specific task/missions either by priority or assigned completion times. We will always have area assignments and consequently a combination of both types. Area assignments are basic to engineers. The installation police map is a good example. Usually areas are allotted to various units and coded normally by colors. Each colored area is an area assignment. In combat, area assignments can and do coincide with tactical boundaries. When they do not, they are delineated by Engineer Work Limits (EWL), a term dropped out of our doctrinal literature but not from actual usage. It has been recommended for inclusion into our new Engineer how to fight manuals. The Forward Working Limit (FWL) is in our doctrinal literature and more in line with actual combat, while the EWL can be used in both peace and war. These terms are used mainly by engineers and can be understood by maneuver commanders. It is essential that all engineers know and use the same terms correctly. Now that the Engineers are again a Combat Arm, engineers must be tactically proficient as well as technically competent, as 80% of all Engineer TOE now have a mission of fighting as infantry. Thus at any one time 34% of all engineer officers, LTC and below, are in a TOE unit with infantry responsibilities. That is significant!

With the introduction of the Combat Heavy Battalion, a combat zone could have two FWL, one into the division rear for Corps Engineers, and one into the Corps rear for COMZ Engineers. I have discussed the FWL in length, for that is something for Engineers to debate. However, support relationships are valid to all branches.

DOUGLAS K. LEHMANN
MAJ, EN
Department of Combined Arms
US Army Engineer School

AS WE GO TO PRESS.

The Extension Training Management Division of the United States Army Engineer School, Fort Belvoir, Virginia, 22060 announces the following resident instruction to be offered to Active Duty, ARNG and USAR personnel during Fiscal Year 1977:

INSTRUCTION	CLASS #	DATES
Commander's Maintenance Management	77-RC-SP1	7-8 Nov 76
Camouflage & Field Fortifications	77-RC-SP2	13-14 Nov 76
Small Unit Training Management	77-RC-SP3	4-5 Dec 76
Elements of Terrain Evaluation	77-RC-SP4	11-12 Dec 76
Engineer Support of River Crossing Operations	77-RC-SP5	8-9 Jan 77
Mine/Countermine Hardware & Operations	77-RC-SP6	15-16 Jan 77
Engineer Reconnaissance	77-RC-SP7	22-23 Jan 77
Fixed Bridging	77-RC-SP8	29-30 Jan 77
Division Barrier Plans & Retrograde Operations	77-RC-SP9	5-6 Feb 77
Base Development Planning	77-RC-SP10	5-6 Feb 77
Small Unit Training Management	77-RC-SP11	19-20 Feb 77
Military Explosives & Their Use	77-RC-SP12	26-27 Feb 77
Camouflage & Field Fortifications	77-RC-SP13	5-6 Mar 77
Construction Management	77-RC-SP14	12-13 Mar 77
Elements of Terrain Evaluation	77-RC-SP15	19-20 Mar 77
Mine/Countermine Hardware & Operations	77-RC-SP16	19-20 Mar 77
Fixed Bridging	77-RC-SP17	26-27 Mar 77
Engineer Support of River Crossing Operations	77-RC-SP18	2-3 Apr 77
Camouflage & Field Fortifications	77-RC-SP19	2-3 Apr 77
Division Barrier Plans & Retrograde Operations	77-RC-SP20	16-17 Apr 77
Engineer Reconnaissance	77-RC-SP21	23-24 Apr 77
Military Explosives & Their Use	77-RC-SP22	30 Apr-1 May 77

For further information regarding any of the above listed instruction, or other types of training available, first check with your unit commander or training technician. If additional information is required

Call: AUTOVON 354-3008/4095
Commercial (703) 664-3008/4095
or write: Commandant
United States Army Engineer School
ATTN: ATSE-DT-TER
Fort Belvoir, Virginia 22060

E7 PROMOTION BOARD ANNOUNCED

All soldiers in grade E6 who have dates of rank before September 30, 1974 will be considered for promotion to E7 during a DA promotion selection board scheduled to convene January 11, 1977.

The upcoming board, to be held at Ft. Benjamin Harrison, IN, will consider in the primary zone of consideration all E6s with dates of rank of September 30, 1971 or earlier. The secondary zone includes all E6s with dates of rank of between October 1, 1971 and September 30, 1974 inclusively. However, soldiers who are restricted from promotion under the provisions of Chapter 7, AR 600-200, will not be considered.

In addition to the dates of rank criteria, soldiers in the zones of consideration must have either a high school diploma or GED equivalent. Eligible soldiers who do not meet this criterion will be screened for action under the Qualitative Management Program.

To insure that soldiers receive at least one consideration for promotion in the primary zone, an exception to policy will allow E6s who will complete 24 years' active Federal service by April 30, 1978 to be considered in the primary zone. These soldiers must meet the other criteria for consideration but must not have been previously considered under this exception to policy.

Additional information and MILPO guidance may be found in the announcing DAPC-MSS-PE message 301525Z September 1976.

YPRES--
The Beginning of Gas Warfare

MAJ Carl V. Hunt Jr.
CPT Virginia M. Shaw

The Geneva Protocol, envisioned in 1925 as the means to ban chemical warfare, has only recently been ratified by the Congress of the United States. The catalyst for the Protocol was the massive use of various chemicals during the conduct of World War I. Estimates of casualities from the use of lethal chemical agents during World War I range as high as one million men.

Although the use of lethal gasses did not decisively affect the outcome of World War I, the potential for doing so was vividly domonstrated by its first use. War had begun in earnest on 4 August 1914 with the German invasion of Belgium. No country was prepared to fight a protracted war; however, the German Supreme Command considered the Schlieffen Plan to be a blueprint for a quick and decisive victory. The initial German advance was finally delayed at the Battle of the Marne where fierce Allied opposition created a 200 mile front by 11 September. During the Allied counterattack, the German forces turned to meet the pursuing Allies. Sir John French, commander of the British Expeditionary Forces, ordered his men to entrench. The Western Front became a fixed, 400 mile trench line when both adversaries proved incapable of turning the others' flanks. The lines extended from the Belgium channel town of Nieuport, south to Noyon, southwest to Nancy and south again to the Swiss border.

On 29 September the Germans attacked Antwerp, a vital seaport on the English Channel. Using awesome 420 millimeter guns, they quickly reduced the town's defenses. Six days later, the remaining garrison at Antwerp withdrew. Concerned that the Germans would attempt to capture other channel ports and endanger British shipping,

Winston Churchill, First Lord of the Admiralty, transferred the Battle-weary British Expeditionary Force to the north. It soon became apparent that neither side could dislodge the other, and equally apparent that neither side would retreat. A stalemate resulted that would confine the carnage to a relatively narrow strip for approximately four years. One opportunity to end the stalemate came in early spring, 1915, at a small town in Belgium. That town was Ypres, a moated medieval town behind a deep bulge in the Allied lines.

In mid-April, 1915, the 3d Canadian Brigade arrived in the Ypres salient to relieve the French defenders. The first order of business for the Canadians was the improvement of defensive positions vacated by the French. Parapets were raised, trenches were widened and interconnected to allow freedom of movement from one area to another without exposure to enemy fire. These defenses could be overcome only at great expense to the attackers. However, the German plans had been laid. A new weapon was to be introduced; that weapon was lethal chemical gas.

On 19 April the Germans launched a murderous artillery barrage on the Ypres salient. Utilizing their monstrous 420 millimeter siege guns to fire powerful one ton high explosive shells the Germans devasted the surrounding area. Their targets were for the most part non-military. Abruptly, the shelling ceased on 22 April. The quiet of the warm, sunny spring day was unnerving. The lull ended late in the afternoon.

Approximately 1600 hours on 22 April, the Germans began shelling the two French Colonial divisions located north of Ypres. The fire was slowly shifted to the Canadian sector and at approximately 1700 hours the shelling ceased again. As the Allies peered over their fortified parapets, a phenomenon was observed which would seem to be more at place in a science fiction novel than on the battlefield in 1915. Over a wide area, there appeared a whitish vapor which gathered and swirled until it settled into a low cloudbank which turned greenish-yellow in the sinking sun. Wind conditions were perfect for the Germans, and the clouds drifed with the light breeze toward the Allied lines.

There was more ample warning of the impending disaster. German prisoners captured in

March by the French had mentioned the emplacement of gas cylinders in the German trenches. In early April, a German deserter warned of cylinders containing asphyxiating gas, and described in detail their emplacement. The deserter also showed the French a simple respirator made from chemically treated cotton for the protection of the cylinder operators. His account was published in the French Fifth Corps' *Summary of Information*, a document which was distributed to the battalion level. A Belgium bulletin reported a high-priority German order, in Ghent, for 20,000 respirators. The order pinpointed the location in the German lines where the attack was to be launched. On 17 April, the Germans themselves gave the final warning in a radio broadcast. The German Supreme Command often imputed their deeds to the Allies in order to justify retaliation; such was the case on this date. The broadcast accused the Allies of having used asphyxiating gas east of Ypres. Unbelievably, all these warnings were ignored by everyone with the exception of the commander of the 11th French Division. He warned the adjacent British and Canadian Divisions, and recommended to his superiors that action be taken to reduce the possibility of a gas attack. He was officially reprimanded, and his recommendations rejected. He was later relieved from his command after it was found that he had been correct. Such was the background for the first poisonous gas attack.

Thus, at 1700 hours on 22 April, 1915, the German cylinder operators turned on the gas for approximately five minutes. The gentle northeasterly breeze carried nearly 168 tons of Chlorine gas toward the Allied lines. Being several times heavier than air, the cloud followed the terrain, settling in craters and ground pockets. The cloud finally reached the French Colonial defenders and obscured their position in a dense fog. The scene was described by a Bristish observer as follows:

"For a few seconds, nothing happened; the sweet smelling stuff merely tickled the nostrils; they failed to see the danger. Then, with inconceivable rapidity, the gas worked, a blind panic spread. Hundreds, after a dreadful fight for air, became unconscious and died where they lay — a death of hideous torture, with the frothing bubbles gurgling in their throats and the foul liquid welling up in their lungs. With blackened faces and twisted limbs one by one they drowned — only that which drowned them came from inside and not from out. Others, staggering, falling, lurching on, and of their ignorance keeping pace with the gas, went back."

In only a matter of minutes the Germans had opened a four and one half mile gap in the Allied lines. An advantage of this magnitude had not been achieved by conventional means. An unprecedented opportunity for break-through existed; yet the Germans were unprepared to exploit their success. Their infantry, without respirators, failed to consolidate their ground positions and the chance of a great coup passed — forever. Canadian and British forces, performing courageously under fire, restored the lines and averted what had been to that point the most dangerous moment of the war.

Casualties at Ypres were astronomical. Of the 15,000 French Colonial defenders, over 5,000 became casualties. In the total conflict, nearly 100,000 casualties marked the battleground around the salient. Lethal chemical warfare, despite its novelty, did not in fact decide, or even materially affect, the outcome of the war; however, its potential for mass casualties was to terrorize the soldiers of both sides until the war ended.

Currently assigned to the U.S. Army Technical Escort Center, Edgewood Arsenal, Maryland; CPT Shaw was previously assigned as an instructor in the Nuclear/Chemical Branch, Department of Military Science, U.S. Army Engineer School from September 1973 to April 1975. During her tour of duty at the Engineer School she received the coveted Master Instructor award. CPT Shaw holds a Bachelor's degree in Chemistry.

MAJ Carl Hunt was previously assigned as as instructor in the USAES. He is presently assigned to Davison USA Airfield.

ENGINEER BREVITY LIST

1LT Terrence W. Miller
1LT Thomas O. Might

An engineer company transmits messages from its CP to battalion headquarters as its platoons report progress on projects. Within an hour the enemy knows the general location of the company and battalion, and they have determined they are engineers. Within twenty-four hours the project sites have been located and their probable nature determined. With this information the enemy can project the intentions of the US Forces.

Here is how it was done.

"A3Z8 This is R4T35. Report 50% completion, project 19. Over."

"R4T35 This is A3Z8. Roger. Over."

"This is R4T35. Out."

The message is clearly received. The intercept operator changes position in his seat and muses over the content of the message. It probably indicates a vertical report to the command or S-3 element of a higher headquarters, informing them of the percentage of completion on an apparent engineer mission of some sort.

Uncoded transmissions similar to the one illustrated above are not uncommon in an engineer unit, particularly at squad, platoon, and company levels. The "urgency of the moment" and the seemingly harmless nature of such a message makes it more desirable to the radio operator to "just go ahead and send it," rather than take the trouble to encode it.

"And what are you saying we should do about it? Encrypt every message before transmitting it over the radio? Isn't that a bit extreme?"

We have no choice. In the ever-present and threatening electronic warfare environment in which combat engineers must function, observance of communications security is vital to mission accomplishment. The radio operator must be equal to the challenge which he encounters. He must be able to send and receive *encoded* messages whose *clear* texts would identify the unit and compromist its engineer mission. To do this he is armed with the weapons of the RTO: the CEOI and certain "low level" code systems.

Within the 39th Engineer Battalion (Combat), the low level code systems have consisted of an authentication table/numerical code, which provides the operator a means of authenticating and encrypting numerical information, and a special engineer operations code. PFC John Q. Average can be taught to use these systems. They are designed to provide short term (30 days) cryptographic security while at the same time being relatively easy to learn and use. Notice that we use the qualifier "relatively."

The 39th Engineer Battalion (Combat) has found the operations code to be no cure-all. The operations code provided is a standard engineer operations code issued to engineer units by the National Security Agency. It provides security, but has also been found to be combersome and time-consuming. Words not included in the code have to be spelled out and then encoded; numbers have to be encoded digit by digit. It is not uncommon to find that a short message takes 25 or more groups to encode. This not only makes the encode/decode process more rigorous, but consumes long periods of valuable radio time for transmission.

Enter the brevity list.

Tasked by the Battalion Commander to produce a workable brevity list prototype for use by the battalion, the S-2 and Communications Sections combined forces to design such a system. It had to be generated internally because NSA presently has no engineer-oriented brevity list available for review and use by line units.

"What is a brevity list?"

It is a listing of prearranged messages and words reduced to numerical trinomes which can then be encrypted using a numerical cipher system. The speed of encryption/decryption using the brevity list plus numerical cipher is much faster than the operations code, and transmission time required is greatly reduced.

The Engineer Brevity List initially constructed within the 39th Engineer Battalion (Combat) was eight typewritten pages in length. It was drawn up on a format that has proven suprisingly successful. The first three pages consist of general prearranged messages. As an example of a general brevity list message, let us assume that a station desires to report 50% completion of Project 19 at 1230 hours. Within the brevity list is found the general prearraged message:

107 - Project (#) is (#) percent complete as of (time) hours.

This message can be numerically reduced to the following series: 107-19-50-1230. From here it is a simple matter to encrypt the message using the authorized numerical cipher. The final transmitted message would sound like this: "I set PJ, I encode ATB QS KM LURD. End of message." Using the engineer operations code, the same message would require 12 three-letter groups to encode.

The brevity list contains a half-page of infantry brevity messages, and the final 4½ pages are engineer mission messages. These engineer messages are organized under six general mission headings: Bridging, Construction, Demolition, Mine Warfare, Obstacles/Barriers, and Reconnaissance.

The brevity list prototype (authorized for production and operational use at unit level by AR 380-52) was used for the first time on the battalion's FTX of March 1976, and used successfully. The list was used even more frequently than expected. An experienced radio intercept operator monitoring transmissions during the exercise remarked favorably on the successful *secure* use of the new system. A comprehensive training program was undertaken prior to the exercise to instruct all users on the brevity list. The majority of users expressed preference for the system over the operations code for routine traffic. The reasons why can be best illustrated by way of comparison, using a sample message:

MESSAGE: Install nuisance minefield at 818095 by 1800 hours.
BREVITY LIST: 697 — Install (type) minefield at (location) by (time) hours.
726 — Nuisance
Numerical series: 697 726 818095 1800
Encrypted: I set AD, I encode SBY WIH GLTOQR NMFE
OPERATION CODE: AUM RRO MQI EHA LSY OOF KTY PEF JSS OTQ MDS XOT QQG DPL ASY LJF NHY CFR OKH SAZ VCC — Group count: 22

In the operations code message, numerals had to be encoded individually and the word "nuisance" had to be spelled out and then encoded. The operations code is clearly more difficult to implement and requires more transmission time.

After its first use in the field, all companies and staff sections were asked to provide the Communications Officer with critiques and recommended changes. Based upon that input, the brevity list was reviewed and revised in time for use in the battalion's ORTT in May 1976.

Although still in the developmental stages, the Engineer Brevity List has already met with encouraging success, and after further perfection the 39th Engineer Battalion (Combat) will send the finished version to NSA for reproduction and distribution. Seen as a positive step in the direction of increased communication security, the Engineer Brevity List will enable the Combat Engineer Battalion to more effectively carry out its vital mission in today's electronic warfare environment.

1LT TERENCE W. MILLER, Signal Corps
University of Massachusetts — Forestry
Signal Officer Basic Course, 1974
Communications-Electronics Staff Officer Course, 1974
No previous assignments.
Currently: C-E Officer, 39th Engineer Battalion (CBT), Fort Devens, MA

1LT THOMAS O. MIGHT, Corps of Engineers
Georgia Insitute of Technology — Industrial Engineering
Engineer Officer Basic Course, 1972
Engineer Equipment Officer Course, 1972
Platoon Leader, 503d Engr Co (LE), USAREUR, 1973-74
Currently: Recon Officer, 39th Engineer Battalion (CBT), Fort Devens, MA

ENGINEER

COLONELS:

ASSIGNMENTS. As of 1 September 1976, there will be approximately 280 Engineer colonels on active duty. Once again, about one-third can expect reassignment during CY 77. Those (of you) in this group, should insure that (your) latest preferences are on file in Colonels Division. There is a continuing requirement for colonels for Attache, MAAG, and MILGROUP positions. Since the lead time is relatively long, any colonel interested in these type assignments should insure that Colonels Division is advised as soon as possible.

RA PROMOTIONS. The Secretary of the Army recently directed that promotion to RA Colonel would be at the completion of 24 years service rather than 25. The results of the Board considering CY 52 has recently been announced. Plans call for these selectees to be promoted to RA Colonel by 31 December 1976. The Board to consider CY 53 will meet in September 1976. These selectees will be promoted upon completion of their 24th year of service (1 January — 31 December 1977).

LIEUTENANT COLONELS:

NEW LIEUTENANT COLONELS. Congratulations to the 118 Engineers who were announced on the lieutenant colonels list published in July. Each officer is encouraged to submit two DA Forms 483 immediately; one addressing assignment desires if the officer is command selected, and a second addressing the officer's desires for other than a command assignment.

TOUR LENGTHS. Most tour lengths at the moment are running at no less than 36 months on station. Officers who have had fewer than four (4) overseas tours and/or who have been in CONUS since 1972 should expect overseas assingments on their next change of station.

MAJORS:

NEW MAJORS. Welcome to all the new majors on the latest list! There are many worldwide requirements competing for your expertise. Within meeting those requirements, you should establish a personal goal of:

- Becoming qualified in your alternate specialty.
- Serving in a troop unit as a major.
- Completing CGSC by either resident or non-resident attendance.

ASSIGNMENTS. Due to a limitation of PCS funds, stability has become even more important in the past year. Unless you are in a must move category (ROTC, civil school, returning from overseas, etc.), not overseas vulnerable, or selected for CGSC, expect to remain where you are for at least three years. Overseas vulnerable?

- You are vulnerable for a Non Dependent Tour if you only have one NDT.
- You are vulnerable for an accompanied overseas tour if you returned from overseas before 1973.

Since there will be approximately 50 majors returning from USAREUR next summer, you can expect an assignment to USAREUR if you fit the above categories. Other possibile overseas assignments include Korea, Iran, Saudia Arabia, Turkey, Panama and SHAPE.

In CONUS, Army Readiness Regions, and Forts Belvoir, Bragg, and Hood continue to be our largest customers. Additionally, there are Engineer majors' positions in the Washington area.

OPMS. We are fully committed to OPMS. If you are not qualified in your alternate speciality, our goal is to get you qualified either by schooling or duty assignment. This may not be immediately possible due to stability constraints and shortages of Engineer majors. For planning purposes, expect to serve one tour in your alternate specialty during your years as a major.

CGSC. CGSC level schooling should be a goal for all Engineer majors. If you are YG 65 or earlier and have not completed the resident course, you should consider enrollment in the Non-resident Instruction CGSC. Enrollment in the Non-resident Instruction will not be a reason for non-selection to the resident course.

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CAPTAINS:

PROMOTION. For those officers selected for promotion to major, recommend you give your new assignment officer, Major Gary Woodham, a call. Officers not selected who have any doubts about their status, legal position, or what Branch thinks about their manner of performance, please call your assignment officer, Major Jim Corbin.

ASSIGNMENTS. In terms of assignments worldwide, it appears that the long drawdown in USAREUR is about to stabilize. We are beginning to see more requirements for USAREUR now. Those officers who have had only one or no overseas assignments or who have been back since 1971 are overseas vulnerable. Korea remains the short tour standby with assignments to Alaska, the Canal Zone, and Hawaii available on an infrequent basis.

Be sure you keep in touch with your assignment officer. He cannot give your desires fair consideration if he does not know what they are. In this day of increased stability, assignment preferences are of increased importance in career planning.

LIEUTENANTS:

MORE NOTES. Assignemnts are well stabilized today. An officer can generally expect to spend **three years** on station in CONUS, **39 months** in long tour areas, and **13 months** in short tour areas. Exceptions will be in geographical areas where location and marital status might be a factor (i.e., Alaska and Panama).

WHERE IS EVERYBODY GOING THESE DAYS? The majority of officers are attending the Engineer Officer Advanced Course at Fort Belvoir, Virginia after long tours or initial CONUS tours. Attendance is still on a competitive basis and your performance record is the main criteria. Foreign service tours are principally in Germany, Hawaii, and Korea. Occasionally, there are tours in Alaska and Panama.

YOU CAN HELP YOUR ASSIGNMENT OFFICER. Send an updated preference statement and an official full length photograph (if you need one) for your file.

A NEW SELECTION BOARD. The Captain AUS Selectin Board will convene on or about 3 November to consider all 1st lieutenants with dates of rank of 30 September 1975 and earlier. If you are in the zone, make sure your file is complete - - - GOOD LUCK!

WARRANT OFFICERS:

USAR APPOINTMENTS. Tentative FY 77 procurement of Engineer warrant officers is currently established as follow: MOS 351A-0; MOS 521A-4; MOS 621A-20; MOS 811A-0; MOS 821A-1; and MOS 833A-2.

AUS PROMOTIONS. The number of Engineer warrant officers selected for promotion to CW4 by the FY 76 Board constituted a selection rate of 27.7 percent of those considered. The overall selection rate was 49 percent. Selections to CW3 constituted 66.6 percent compared with an overall selection rate of 64 percent. It appears that while the older warrants are suffering from low OER's that failed to keep them competitive, the younger warrants being considered have generally been rated as high or higher as their contemporaties in other branches.

FOR ALL:

OFFICER RECORD BRIEF. Be sure to pay close attention to the accuracy and completeness of information on the Officer Record Brief (ORB) during the annual field audit. The ORB is gaining wide use as both a management tool for assignment officers and as a vehicle for quickly gaining a thumbnail sketch of an officer's experience by members of selection boards. Inaccurate or incomplete ORB information should be corrected immediately.

CORRESPONDENCE ADDRESS. An attempt is made to contact each officer prior to reassignment; however, MILPERCEN has an incomplete listing of current telephone numbers. It would be appreciated if each officer would send in a postcard giving his current AUTOVON duty phone number, and always include both your complete mailing address (with zip code)and phone number when submitting a DA Form 483.

ENGINEER

Soldiers receiving selective and variable reup bonuses (SRB and VRB) who face legitimate financial hardship are entitled to apply for accelerated payment of one or more annual bonus installments. This also goes for troopers experiencing compelling compassionate reasons. That's the word from officials at the MILPERCEN Monetary Incentives Management Branch (MIMB).

However, officials caution that these requests are not approved automatically. As final approval authority, MIMB evaluates each request for accelerated payment on an individual basis.

An accelerated bonus payment is not intended to alleviate indebtedness caused by gross financial mismanagement by the soldier or his dependents. Instead, the accelerated payment is designed to help the soldier return to a position where he can meet his monthly expenses without financial strain.

Cases of severe financial hardship generally will warrant accelerated payment of not more than two bonus installments. For example, let's say a soldier reenlisted for six years on 1 October 1975. In March 1976, he applied for accelerated payment because he experienced a financial setback: his mobile home was destroyed by fire. What's more, his wife was injured seriously and won't be able to work for at least a year. MIMB reviewed his application and approved accelerated payment of the two installments he eventually would receive in October 1979 and October 1980. The three remaining installments will be paid on schedule — that is, on the anniversary dates of his reenlistment in October of 1976, 1977 and 1978.

If MIMB approved only one installment payment in this case, the soldier would have received advanced payment of the October 1976 installment. His next installment would not be paid until October 1977. Thereafter, his payments would come in October 1978, October 1979, and October 1980.

Occasionally a soldier is confronted with situations or emergencies involving a family member or even a close nondependent whom he is morally obligated to assist financially.

Depending on individual circumstances, accelerated bonus payments may be approved for compassionate reasons. Examples include an immediate need for financial assistance to cover funeral expenses or to pay medical costs not covered by military or commercial insurance plans.

To qualify for accelerated payments for compelling compassionate reasons, MIMB requires applications supported by verification statements from doctors, lawyers, Red Cross representatives, clergymen, or the soldier's Commanding Officer. If approved, either one advanced installment or two accelerated payments normally are authorized and paid in the manner already described.

MILPERCEN officials offer the following guidelines concerning types of requests for accelerated payment that are most often turned down:

- All requests which are intended solely for investment purposes — down payments on homes, autos, land purchases.
- All requests to alleviate large debts incurred in anticipation of MIMB approval of advanced payments immediately after reenlistment.
- Any requests which, upon MIMB review, indicate that after debts and normal monthly household expenses, the soldier has $75 or more remaining for miscellaneous expenses or emergencies. It should be noted, though, that the $75 amount is only a rough guide; MIMB also considers such factors as when the next bonus installment is due and how long it will take the soldier to pay off all current debts. Therefore, it is very important that the applicant include with his request a precise listing of all monthly living costs so that this case can be judged fairly.

There also are certain types of debts which normally indicate financial mismanagement on the part of the service member and his dependents and therefore weaken a soldier's chances for accelerated SRB/VRB payments. These include:

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- Recent purchase of two or more cars unless the service member and spouse work and two cars are absolutely essential.
- Recent purchase of expensive housing or other vehicles plainly beyond the soldier's needs and means.
- Purchase of expensive household goods, encyclopedias, utensils, stereo/TV sets and other items which his detailed listing of current debts plainly indicates he could not afford.

Each request, MIMB officials say, must be accompanied by DA Form 4474-R (Request for Accelerated Payment of SRB — Hardship or Compassionate). Completion instructions are outlined in Change 57 AR 600-200. Improperly documented applications are returned through channels without action. All others will be processed quickly for the sake of the soldier suffering the financial hardship. Since all requests must be initiated at the installation level, local authorities may disapprove requests that clearly do not meet the criteria.

MILPERCEN officials remind soldiers that effective budgeting sometimes precludes the need to apply for accelerated payments. Those experiencing financial woes should be aware of the Army Community Services' Budget Counseling Program. This program is designed to help soldiers liquidate debts and assist soldiers in establishing and maintaining personnally tailored budgets.

Staffed largely by volunteer budget counselors, this organization acts as an intermediary between the soldier and his creditors. Counselors work to have interest rates reduced or dropped, and, in some cases, they have been successful in having monthly payments reduced.

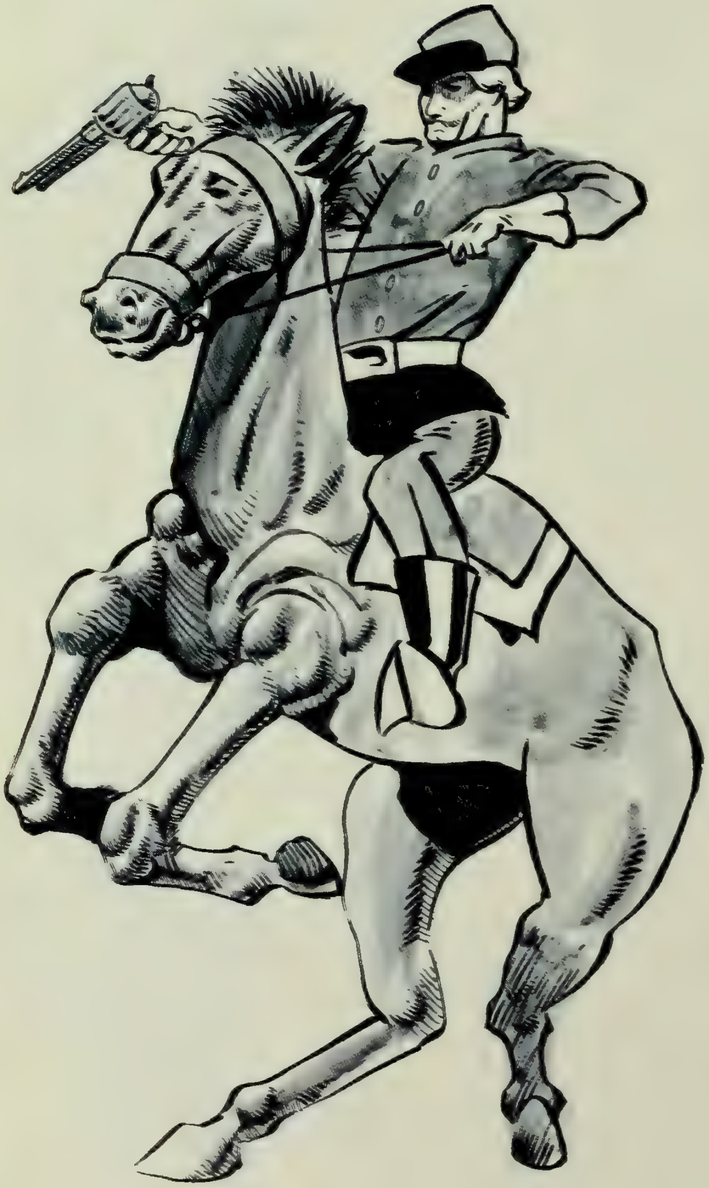
While the ACS budget counseling service is free, success of counseling efforts depends on the soldier's willingness to solve financial problems through payment of just debts.

ENGINEER PERSONNEL MANAGEMENT CONTACTS IN OPD.

Colonel Division (DAPC-OPC-AE)
  Engineer Assignments, LTC Tom Sands, x7871
Lieutenant Colonels Division (DAPC-OPL-AS)
  Engineer Assignments, LTC Henry Covington, x0423
Majors Division (DAPC-OPM-A)
  Engineer Assignments, MAJ Gary E. Woodham, x8109
Combat Support Arms Division (Company Grade) (DAPC-OPF-E)
  Engineer Branch Chief, LTC Norman Kuklinski, x0650
    CPT Assignments, MAJ James E. Corbin, x0651
    LT Assignments, CPT Michael R. Foster, x7426
    Professional Development, MAJ Roger Yankoupe, x0617
      MAJ Ken Kessler, x0617
Warrant Officers Division (DAPC-OPW-AU)
  Engineer Assignments, CW3 Frank Russell, x7837
Professional Development Division (DAPC-OPP-S)
  Engineer Specialty Monitor, MAJ Tom Ostenberg, x0417
  Chief, Plans Branch, MAJ Galen Yanagihara, x8152

NOTE: Commercial telephone line: Listed numbers preceded by Area Code 202-325
AUTOVON line: Listed numbers preceded by 221

Buffalo Country



MAJ John M. Gosdin

From the eastern slopes of the Rocky Mountains to Fort Gibson in the Indian Territory, Lieutenant James W. Abert led a reconnaissance expedition in 1845 typifying the military-political partnership that made the policy of Manifest Destiny a reality. Scion of a military family and member of the Corps of Topographical Engineers, Lieutenant Abert was only twenty-two years old when he set out on his trek. Across uncharted buffalo country, Abert recorded events and observations having value far beyond short- and intermediate-range military objectives. Through the narrative report of his observations, a rare window is opened on a virgin land, its since vanished inhabitants, and the conduct of an engineer reconnaissance expedition.

Prelude to National Expansion

Texas had been annexed in 1845, a mized bargain. Along with vast new territory, the United States also had assumed liabilities: a debt of suspicion, a legacy of brooding irritations toward Mexico. Bruised national pride on both sides of disputed borders was not to be assuaged through negotiation.

While Texas was the cause and pretest for war, President Polk coveted New Mexico and California as the true spoils of the looming conflict with Mexico. With the expansionist Congress rallying around the banner of Manifest Destiny, the military establishment was put on notice that battle was imminent.

Warclouds on the immediate horizon masked other more distant warclouds. Like a summer thunderstorm, the conflict with Mexico would burst suddenly and violently, but quickly be finished; the second conflict which was already rumbling and muttering would continue sporadically for a third of a century until, finally, the native redman would be swept off the land so new waves of inhabitants could farm and ranch unmolested. In both cases the need for information based on solid facts was paramount and one which the officers of the Corps of Topographical Engineers were trained to meet.

Reconnaissance

To develop reliable data for strategists, three reconnaissance expeditions were conducted in 1845. Originally only two expeditions had been ordered westward; but out of the second a third would be formed. With five companies of dragoons, Colonel Stephen W. Kearny made a 2,200-mile journey across the northern plains along the Oregon Trail; he then looped southward to Bent's Fort, in what is now southeastern Colorado, enroute to St. Louis. Before Kearny's return, the second expedition under the command of Captain John C. Fremont was dispatched with the overt mission of surveying the Arkansas and Red Rivers. Lieutenant James W. Abert, son of Colonel John James Abert, Chief of Topographical Engineers, was a junior officer with this second expedition.

Organization of Abert's Expedition

At Bent's Fort Fremont and his party stopped for several days to rest and resupply. Then, before departing under secret orders on an extended political reconnaissance all the way to California, he divided his forces. To complete the mission he was originally given, Fremont formed a detachment, placing Lt. Abert "in chief command" and naming Lt. William G. Peck, also a Topographical Engineer, to assist him.

In exercising his responsibilities as commander of the survey party, Abert quickly began to make preparations for launching the expedition. He tried in vain to secure the services of a Kiowa Indian named Tah-kai-buhl, who wielded considerable influence among all the roving Plains tribes and was knowledgeable about the surveying party's proposed route of march. Dismissing all entreaties, the Indian guide refused to go on the reconnaissance. Other guides were obtained, however. Besides Thomas Fitzpatrick, an experienced guide, Caleb Greenwood and John Hatcher, two mountain men in the service of the redoubtable trader William Bent, agreed to serve as hunters and accompany Abert as far as the trading houses Bent had established on the Canadian River. Thus, the expedition was quickly assembled.

Besides gathering together the men and supplies, Abert proceeded promptly to plan the technical aspects of his reconnaissance. Only a sextant and a chronometer would be available for making the survey. Thus, the expedition would be hampered due to lack of equipment even as it dealt with the risks associated with operating in hostile territory. With a trigonometric survey being impossible, a linear survey supplemented by astronomical observations was to be used for the survey. In performing the linear survey, principal points were selected and latitude and longitude calculated. For latitude, precise observations were made of stars near the zenith; for longitude, a determination of the position of the moon and moon-culminating stars was required.

To record the details of his military reconnaissance, Abert began a journal on August 9, 1845. If the diary was to officially document the events and observations on the expedition, Abert's sketchpad with its pencil and watercolor illustrations was to enliven and enrich his narrative record, adding a new dimension to its informational contents.

In addition to the two officers, the guide and two hunters, thirty men and two servants rounded out the roster for the journey. The caravan consisted of seven horses, fifty-six mules, and eight rangy steers. And, with some apprehension, a few wagons were made ready to haul equipment and the limited store of supplier: eight fanegas of "unbolted Mexican flour," three or four boxes of macaroni, a small quantity of rice, two months' supply of sugar, and ample supplies of coffee and tobacco. Other provisions would have to be acquired by hunting and foraging along the way.

Fremont had hoped to send a small howitzer with Abert's party, since encounters with Indians were expected and maneuverability would be reduced due to the wagons. No artillery was available. Without a howitzer to awe the Indians, the explorers would have only their spunk and wits to rely on — but these were no small assets.

On August 9, 1845, Lieutenant Abert and Peck moved out of Bent's Fort a short distance to pitch their first camp and prepare for departure. The following day, Fremont sent his instructions to Lt. Abert assigning to him the specific mission: "to survey the Canadian from its source to its junction with the Arkansas, taking along the way the Purgatory River, and the heads of the Washita, called Buffalo Creek and Cut-nose Creek by the Indians."

Along the Purgatory

The next morning, when the prairie sage was in its luxuriant abundance, the four mess tents were folded and utensils and supplies stowed away in the wagons; the men climbed into the saddle and the signal to move out was given. Abert's expedition was officially underway. Familiary landmarks, the Spanish Peaks and the faint snowy summit of Pike's Peak, kept them company for several days as their route followed the Arkansas River westward to its junction with the Purgatory. From there the survey party continued up the Purgatory in a southwesterly direction, eventually crossing through Raton Pass and then bending southward to the headwaters of the Candian River.

Pitching their tents near the stream which "forms the principal source of the Canadian," Abert determined the latitude to be 36° 40' 07" and the longitude to be 104° 35' 58". (See map.) Thus, the starting point for his survey was established and the first portion of his mission was achieved. Major hardships and privations would lie ahead; to this point he had been traveling generally along the Santa Fe Trail, but unfamiliar, uncharted territory was soon to be encountered.

Buffalo Country: Indians and Ciboleros

Along the march, as the expedition proceeded down the Canadian, Abert was watchful for bits of information having significance for military intelligence purposes. Faint traces of wagon wheels were followed until a piece of tool-worked wood was discovered; another piece of wood bearing augur marks was found among float-wood debris. The crude workmanship caused Abert to suspect recent passage by Mexican "ciboleros" who frequently ventured across the eastern plains to trade with the Indians and procure supplies of buffalo meat. An additional inference, one of immediate practical use to the survey party, was that the trail the ciboleros had blazed was a feasible one for descending the Canadian. Numerous broken axletrees which were subsequently found provided mute testimony to the high level of usage being made by Mexican traders and meat-hunters, as well as demonstrating impracticality of using wooden-wheeled Spanish carts (carretas) for hauling heavy loads over the bumpy trail.

Of serious portent, the fresh trail of a large mounted Indian band was encountered. Soon, signal fires were observed and Abert correctly surmised the smoke was conveying "the intelligence of strangers, and perhaps enemies, in the country, to the main band, which we supposed to be near." The visible presence of Indians prompted further precaution as the expedition proceeded through Comanche country. At night the wagons and tents were drawn up into a defensive corral (or "kraal" as Abert called it) in conjunction with a bluff, deep ravine, or other natural obstacle.

The signs of Indians increased and finally a small group of Buffalo Eater Comanches showed themselves on the crest of a distant hill. The guide Fitzpatrick, under a white flag, induced them to enter the camp where coffee and food were hungrily consumed by the Indians and tobacco was smoked. Through Hatcher and Fitzpatrick who acted as interpreters, Abert explained that his party represented the United States government on a peaceable mission.

The Comanches found it difficult to comprehend why a group of armed men with wagons would be crossing the plains on a mission that was neither to trade nor to make war. Their curiosity piqued, the Indians trailed the explorers and observed their movements for several days. Occasionally, braves would approach the camp to parley; at these times, Abert elicited information on the terrain ahead as well as news on the relative states of war and peace among the roving tribes.

A new band of Indians made their presence known on the night of September 12th. Discovering the trail of the explorers, Kiowa Indians assumed the interlopers to be Texans, whom the Kiowas held as hated enemies. Stealthily during the night, warriors crept to within ten feet of the tents where the Americans were sleeping. One warrior fitted arrow to bowstring and drew it to head before responding to inner promptings and creeping away in the darkness. The Indians claimed the next day the Great Spirit had warned them these might be Americans instead of Texans and they had restrained their arrows. Tobacco and other items were presented to the Kiowas. A warrior named Tiah-na-zi and his wife were persuaded to travel with the expedition as scouts and as intermediaries with other Indians who might have mischief in mind.

The survey expedition continued on down the Candian trekking across level plains and paralleling the high banks of the river; occasionally Abert was forced to skirt tributary ravines or avail himself of a buffalo path leading toward the river for water or for smoother traveling along the lower banks. Often steep inclines or sandy bottoms made pulling hard for the wagons and teams. When this occurred additional mules were hitched onto the wagon or men dismounted and put their shoulders to the wheel. Sometimes pry-poles and ropes were required to move the wagons.

Headwaters of the Washita

Beginning a swing southward on September 16th, Abert sought the headqwaters of the Washita River (or False Washita as it was sometimes called). A north bank tributary of the Red River, the Washita paralleled the Canadian some fifteen to twenty miles to the south. At this point, Hatcher and Greenwood bid the party farewell and turned back to Bent's Fort; the Kiowa guides also left the expedition at this juncture.

After extricating themselves from the "labyrinth of ravines," the explorers entered onto the Llano Estacado, the famous tableland called "staked plains" by Spanish explorers who preceded them. Abert noted that the Llano Estacado is "the most extensive and continuous of the plains lying the desert country, and gives rise not only to the Washita but to all the main branches of the Red River, as well as the rivers of upper Texas.

While encamped near the Washita, dusky figures in the night caused the alarm of "turn out!" to be sounded. A second band of roving Kiowas also had mistaken them for Texans and crept close to the camp to listen to them talk. The Indians were unaware that Americans and Texans spoke the same language.

In a novel attempt to glean information from a council of venerable old men of the Kiowas, Abert placed a map of the territory before them. (The map had been made at Bent's Fort by Tah-kai-buhl, the Kiowa who refused to accompany the expedition.) The young officer noted whimsically in his journal: ". . . a great discrepancy of opinion existing among them, like most celebrated politicians, they at length agreed to compromise and represented all the rivers as running parallel, ad infinitum."

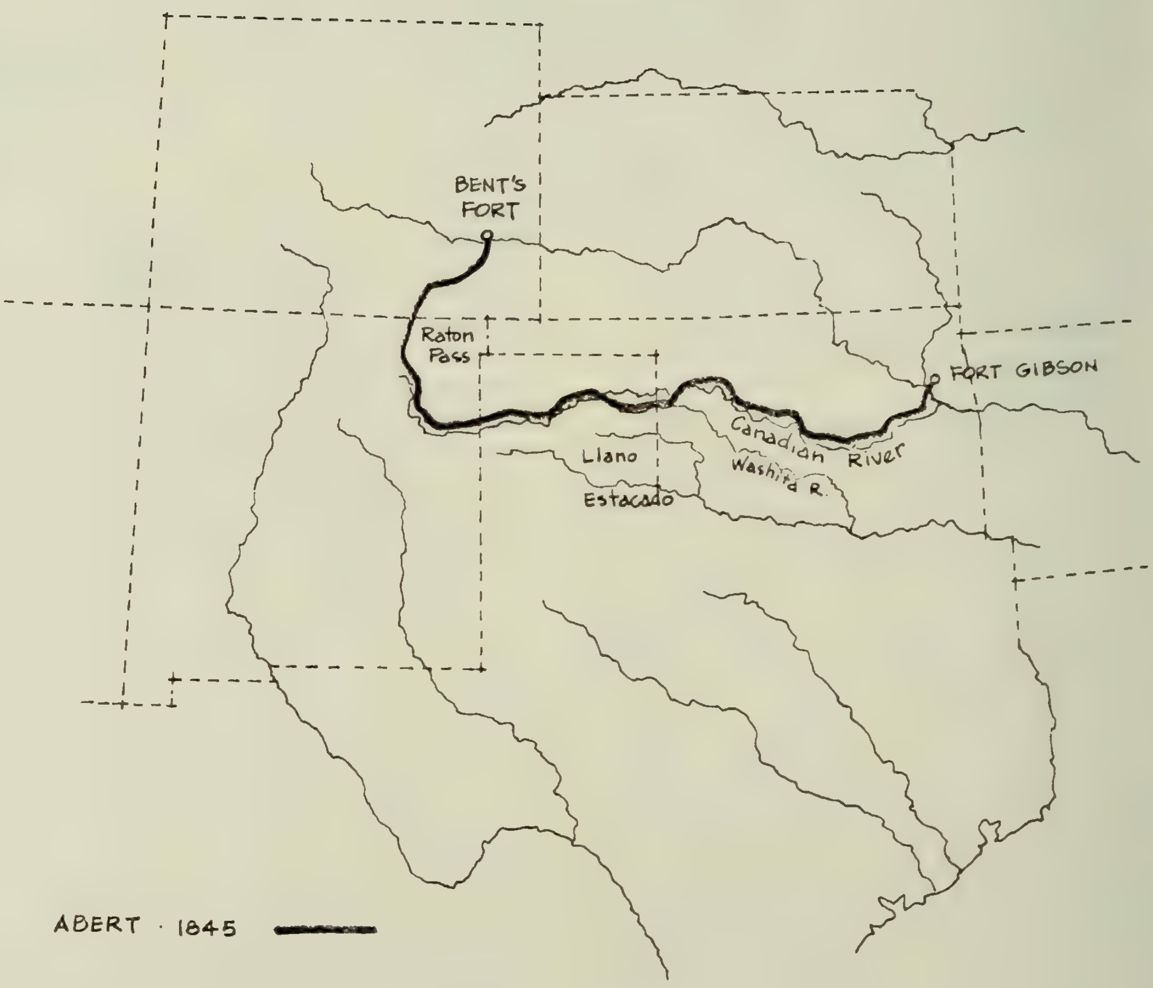
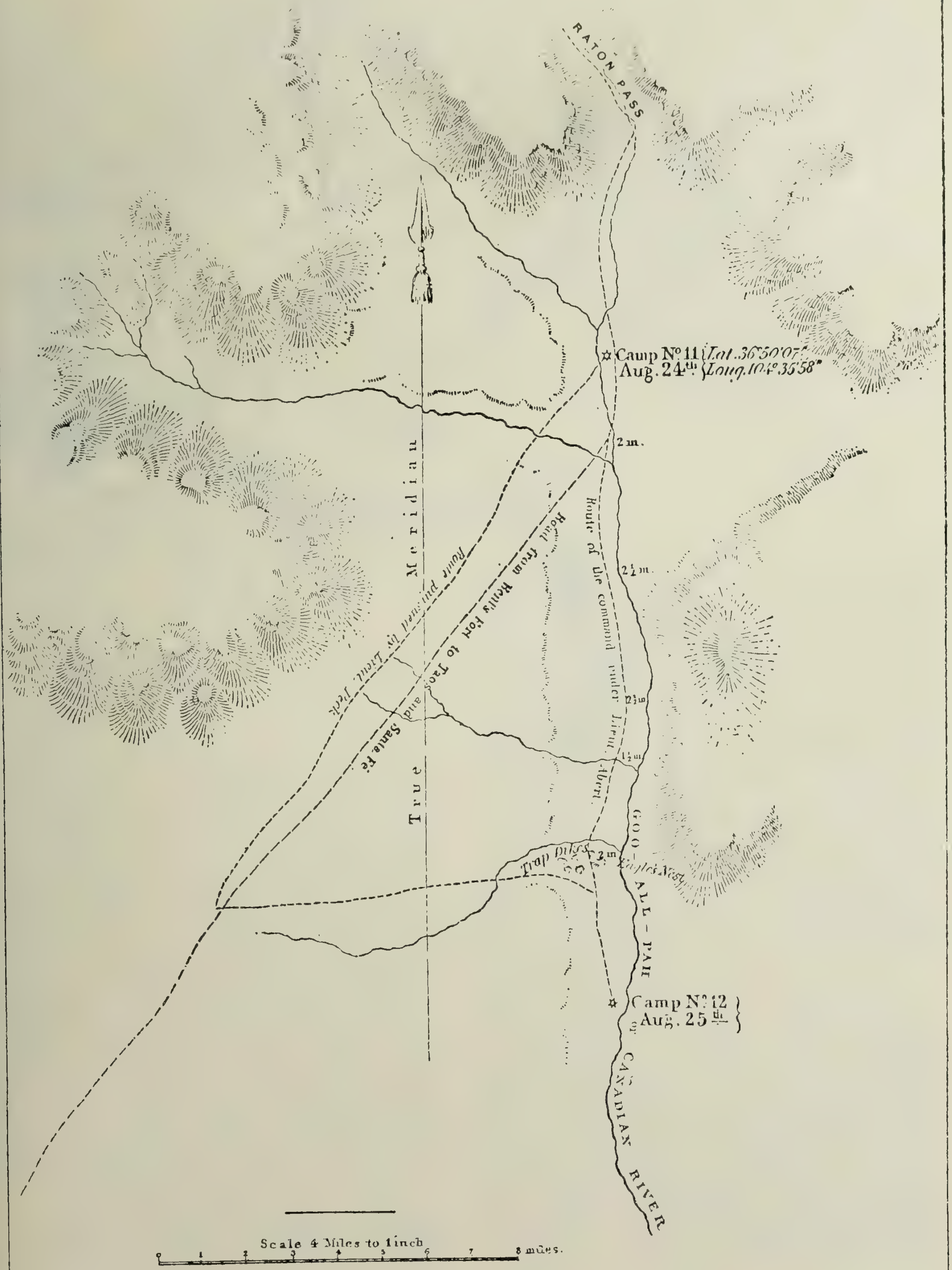


Figure 1. Route of the Expedition Commanded by Lieutenant James A. Abert in 1845

Figure 1. Route of the Expedition Commanded by Lieutenant James A. Abert in 1845.

Figure 2. Abert's Sketch of a Day's Travel*


RATON PASS
True Meridian
Camp No. 11 {Lat. 36°50'07" / Aug. 24th {Long. 104°35'58"
2 m.
Route pursued by Lieut. Peck
Road from Bent's Fort to Taos and Santa Fe
Route of the command under Lieut. Abert.
2½ m.
2½ m
1½ m
Trap Dikes
2 m
Eagle's Nest
GOO-ALL-PAH
Camp No. 12 / Aug. 25th
CANADIAN RIVER
Scale 4 Miles to 1 inch
0
1
2
3
4
5
6
7
8 miles.

*This map showing Raton Pass, the Santa Fe Trail, and the headwaters of the Canadian River appears as an insert between pages 18 and 19 of Abert's Journal.

After obtaining three astronomical points on the headwaters of the Washita and skirting Antelope Buttes, the explorers returned to the Canadian. The meandering course of the Canadian often forced the adventurers to blaze new trails as they moved eastward. Once again they relied on buffalo paths to lead them to the best routes. Abert recounted his reasoning why buffaloes were good pathfinders and trailblazers: "These animals being so large, and seemingly averse to great exertions, have been endowed by nature with an instinct which invariably leads them to select the most gentle ascents and descents, enabling them to seize every advantage which the ground offers. These paths are also remarkably straight, and as the animals generally move in file they are deep and remain distinctly visible for a long time.

In marches of thirteen, seventeen, or once even as much as twenty-five miles per day, the expedition moved rapidly through the wooded region known as the Cross Timbers. Small prairies flanked by hillocks covered with mottes of blackjack and other species of oak teemed with wildlife. Turkeys, duck, and quail provided a change of fare for the weary travelers. Buffalo herds were plentiful and chunks of fat buffalo meat often hissed over the glowing coals of cooking fires. Abert learned the Commanches had been present in considerable numbers hunting buffalo on the Canadian, but upon learning of his approach, had broken camp and fled to hideaways in consternation. A few days later, signs of hostile Indians disappeared; the party had safety passed through hostile Indian country.

The terrain became highly dissected; creeks forced numerous detours delaying their advance and adding to their hardship. But this was the last terrain obstacle, and once this was behind them, the land became gentle and bucolic.

Daily progress was rapid after Abert entered the Indian Territory known as present-day Oklahoma. Soon various signs — pictures and letters marked on trees — gave notice of the presence of "half-civilized" Indians. Wild hogs were encountered, giving further indication of the expedition's imminent approach to settlements of the Kickapoos, Quapaws, Creeks, Seminoles, and other Indian tribes that had been pushed off their lands further eastward. From these Indians Abert and his troops acquired sweet potatoes, corn, and sugar in exchange for powder, lead, and tobacco, which were then only burdensome.

Completion of the Survey

By now, Abert was nearing the end of his reconnaissance. On October 19th he placed Fitzpatrick in charge of the expedition while Lieutenant Peck and two soldiers accompanied him to the confluence of the Canadian and the Arkansas Rivers. The survey instruments were brought along so Abert and Peck could fix the point of juncture through astronomical observations, thereby completing the assigned mission. The remainder of the group would proceed directly on to Fort Gibson, the frontier outpost which was soon to be the staging point for dragoons moving southward to Texas and ultimately Mexico.

On October 21st, several observations were made and a point some four miles above the mouth of the Canadian was established at a latitude of 35° 28' 18" and longitude 95° 58' 11". (Thick canebrakes had precluded their progress to the exact point of confluence.) While the survey was technically completed, Abert decided to continue with the reconnaissance the short distance remaining to Fort Gibson. There his final observations would be made and the survey would be connected to familiar landmarks.

On the evening of October 21st, Lieutenant Abert and Peck and the two soldiers who accompanied them were welcomed within the hospitable walls of Fort Gibson by Lieutenant Colonel R. B. Mason, Commander of the 1st Dragoons. The next morning, Fitzpatrick and the remainder of the reconnaissance party arrived.

New, improved wagon roads beckoned as the group, after two days' rest, left Fort Gibson to muster out at St. Louis. All along the way, Abert noted in his journal, roads were "literally lined with the wagons of emigrants to Texas, and from this time until we arrived at St. Louis we continued daily to see hundreds of them."

With the situation with Mexico worsening and Indian clashes continuing to occur, the swelling flow of emigrants served only to heighten tensions; ultimately a sustained military presence would be required in Texas and the American West.

Conclusions

Besides his contributions to the first scientifically derived maps of the area, Abert's record of the land and life in the southern Great Plains in the days prior to settlement is replete with rare and practical observations. Through the text and illustrations of Abert's expedition, authoritative information about the Kiowas and Commanches was first gained for the federal government. Geographical descriptions of exploitable mineral and water resources, forests, and farmlands — as well as obstacles and disamenities — served a practical purpose for military planner and emigrant alike.

While documenting an impressive reconnaissance, the travel journal also sets Lieutenant James W. Abert and his expedition squarely in the midst of events at a time which shaped the boundaries and challenged the spirit of a young, exuberant America.

Major Gosdin is Training and Operations Officer (S-3) of the 871st Engineer Battalion (CBT) (HV) (USAR) in Austin, Texas. Previous assignments include Company Commander and other staff positions in the 420th Engineer Brigade (USAR) Headquartered in Bryan, Texas. While on active duty, Major Gosdin served in Germany with the 23d Engineer Battalion (Combat). He holds B.S. and M.S. degrees from Texas Tech University, is a graduate of the Command and General Staff College and is a registered landscape architect in Texas.

NBC

What about Nuclear, Biological, Chemical (NBC) training? The threat is real and very impressive and your unit has a long way to go. You have always been a pretty good small-unit trainer, but NBC is a little different. Do you really know where to begin?

As the Army once again orients itself toward a general war in Europe, planners are becoming aware of a serious NBC readiness gap between our forces and those of our potential enemies. The gap is not a matter of doctrine or technology; the crucial difference lies in realistic on-th-ground training at company and platoon level. Realizing this, the Army's leaders have placed a new emphasis on training men and units to survive and operate in an NBC environment.

This renewed interest in NBC is being felt by small-unit trainers. You now have the command emphasis you need to buy time on the training

CPT Paul M. Pittman, Jr.

Warfare Training

schedule, and you need some concrete advice about starting a unit NBC training program. This article is designed to provide the initial guidance you are looking for.

The best place to begin, is with the publications. The following basic items will enable you to put together a complete NBC training program:

- AR 220-58 together with its local supplements, defines NBC responsibilities and puts the training burden exactly where it belongs — on the commander. In addition, this manual provides the basic design for a company-level NBC defense organization, with its various specialists.
- FM 21-40 is the basic guide to survival and operations in an NBC environment. Appendix B provides a detailed description of NBC standards of proficiency for individuals, units, and specialists.
- FM 21-48 outlines specific procedures for NBC training and testing.
- TM 750-15-5 catalogs virtually all NBC equipment, giving descriptions, stock numbers and allocation data.

NOTE: Check your TOE, MTOE or TDA for the equipment authorized at your level.

- ARTEPs are available for training management in engineer units, and you will be expected to tailor your NBC program to your unit ARTEP. This should be fairly simple since these documents are designed with decentralized training in mind. They assign task priorites (normally high ones for NBC tasks) and offer flexible guidelines for scheduling training and for ordering supplies and ammunition.
- SOPs or other guidelines for higher headquarters that are available.

A logical sequence for NBC training progresses from the very basic to integrated training during unit field operations. Of course, the program must build on and progress from individual to unit skills, but often both levels can be taught together. You can prepare for training tests by including individual and unit proficiency tests (like the examples found in FM 21-48) in your training program. Remember that testing is also an effective means of teaching.

The initial training should be based squarely on the individual and unit standards found in Appendix B of FM 21-40. These standards are simple, direct, and designed for performance oriented training. A quick review will convince you that these basic skills will be the essentials of survival and mission accomplishment in an NBC environment. Obviously, field training must be designed to reinforce and test knowledge gained in the initial training.

NBC field training, to be effective, should be mission related, performance oriented, and realistic. In other words, you should make NBC a regular part of mission training. This is not as difficult as it sounds: let's say your unit's mission for today is a land clearing operation. To add an NBC twist you have liberally covered the area with a chemical contaminant, a mustard agent simulant composed of used motor oil, with a touch of garlic to give it the right odor. Then you added some powdered CS (tear agent) to make the contaminated area even more convincing. Now your unit must perform its normal mission in an NBC environment, and you have everything you need to reinforce your previous instruction in detection, protection, decontamination, or first aid.

A sound working knowledge of the NBC tactics of our potential enemies is vital if you hope to make such training believable. For too long we have trained our soldiers to react to the "pop" of a tear gas grenade, knowing full-well that no enemy is likely to stage a chemical agent attack using hand grenades. To gain authenticity, chemical attacks should occur without warning and, if possible, at night. Your unit must learn to take immediate defensive action at any time, while moving or standing still.

One way to achieve credibility in training lies in the proper use of training munitions. These munitions, ranging from a convicing nuclear burst simulator to tear gases, are discussed in FM 21-48. CS should be used off target, upwind. Powdered CS, used with a hidden disperser or covered with leaves on a road or trail, creates an impression the gas chamber can never equal. To simulate an artillery attack you can coordinate the arrival of a CS cloud from an upwind disperser and the use of artillery simulators. Remember that combat training is meaningless unless it duplicates combat.

Part of your attention must be devoted to your unit NBC specialists. In addition to the company NBC Defense Officer, NCO, and Enlisted Alternate, you will probably be required to maintain a company decontamination squad. In addition, each piece of radiac equipment and each chemical detection kit on your TOE must have two trained operators. One solid approach is to train these detection specialists and the decontamination team under the NBC Defense Officer and NCO respectively. If your unit is committed, they can operate with the same breakdown. These are the normal requirements, but your unit could be required to train and deploy additional teams: damage control parties (a likely engineer mission), rescue squads or additional survey or decontamination squads. At company and platoon level all of these jobs will be additional duties.

Another thing you will have to do is master your unit NBC equipment. This will mean getting it out of the supply room and using it. Most company commanders own NBC equipment they can't use. There may be a few things they don't even recognize. A perfect example is the gas particulate filter for the tracked vehicle. Chances are it isn't working even if it's mounted. It's time for you to get the TOE NBC equipment off the shelf and put it to use. To support you, the inspection emphasis, where NBC equipment is concerned, is rapidly shifting from appearance to employment.

Your first point of contact for training is, of course, higher headquarters. Depending on its TOE, your battalion might have a Chemical NCO. At any rate, the S3 has staff responsibility for NBC training and operations. At brigade level there will be a two or three man chemical section and at division, normally a ten man section. Close coordination with these chemical specialists can save a lot of steps in putting together a training program. Another source of advice and assistance will be your post, camp, or station NBC school. The school exists primarily to provide training for unit NBC Officers, NCOs and specialists, but it can do a lot more for you. The cadre will know all the ins and outs of training areas, supplies, equipment, and local rules and regulations. Such close coordination has a hidden benefit: division and post level NBC inspectors are usually drawn from the division chemical section of the NBC school.

The recent upsurge in emphasis on NBC training has left publications in a state of flux. Specific items are being revised at a rapid rate, but the list provided below should help you get started. These references are basic items that will fit into any company training library.

A number of excellent, up-to-date training films are available. One of the best is "Individual Protection Against C and B Operations and Nuclear Warfare" (TF 3-3966), which follows an infantry squad through a series of NBC attacks and, in the process, teaches virtually all of the individual survival standards. The films listed in the reference section are all recent, color editions.

If you want to add still more visual punch to your training, the possibilities ar endless. Some excellent TV tapes, TEC programs, and graphic training aids are available, and new ones are coming out at a rapid rate. Your local Training Aids Service Officer or Audio-Visual Centre can give you up-to-date information. The Extension Training Management Division at most major training installations is another source of visual material. If you plan to use films, tapes, or GTAs that have to be ordered, allow yourself at least two or three weeks of lead time.

No matter how you approach your particular training situation, keep in mind that you are dealing with a survival subject. The key to proficiency and survival is a thorough, realistic training program.

Captain Pittman graduated from Wofford College in 1966 and has done graduate work at the University of Virginia and Pepperdine University. He is a graduate of the Infantry Officer Advanced Course and, by correspondence, the Engineer Officer Advanced Course.

REFERENCES

The following partial list of references provides a guide for conducting detailed research on NBC operations and defense to include TOE equipment. The list is provided to serve as a starting point for unit NBC references.

1. Army Regulations

220-58	Organization and Training for Chemicl, Biological, and Radiological (CBR) Defense
700-62	Chemical Protective Clothing Policy and Utilization of Certain Chemical Corps Units and Equipment in Combat Areas

2. Department of the Army Pamphlets (DA Pam)

39-3	Nuclear Weapons
108-1	Index of Army Motion Pictures and Related Audio-Visual Aids

3. Field Manuals (FMs)

3-2	Tactical Employment of Riot Control Agents CS
3-8	Chemical Reference Handbook
3-10	Employment of Chemical Agents
3-21	Operational Aspects of Radiological Defense
3-22	Fallout Prediction
8-9	NATO Handbook on the Medical Aspects of NBC Defensive Operations
21-11	First Aid for Soldiers
21-40	Chemical, Biological, Radiological, and Nuclear Defense
21-41	Soldeir's Handbook for Defense Against Chemical and Biological Operations and Nuclear Warfare
21-48	Planning and Conducting Chemical, Biological, Radilogical (CBR) and Nuclear Defense Training

4. Technical Manuals (TMs)

3-215	Military Chemistry and Chemical Agents
3-216	Technical Aspects of Biological Defense
3-220	Chemical, Biological, and Radiological (CBR) Decontamination
3-221	Field CBR Collective Protection
3-4240-202-14	Operator's Organizational, DS and GS Maintenance Manual; Mask, Chemical-Biological, Field, ABC-M17 and Accessories
3-4240-258-14	Operator's Organizational, DS and GS Maintenance Manual; Mask, Chemical-Biological, Field, M17A1 and Accessories
3-6665-253-12	Operator's and Organizational Maintenance Manual; Detector Kits, Chemical-Agent, VGH-AN-M15A2A and AN-M15A2N
3-6665-225-12	Operator's and Organizational Maintenance Manual; Alarm, Chemical Agent, Automatic, Portable M8
8-285	Treatment of Chemical Agent Casualties
10-277	Protective Clothing, Chemical Operations
11-6665-209-15	Operator, Organizational, DS,GS, and Depot Maintenance Manual, Radiac Sets, AN/PDR-27J, AN/PDR-27L, and AN/PDR-27Q
11-6665-214-10	Operator's Manual, Radiacmeters IM-9E/PD, IM-92/UD, IM-93A/UD, and IM-147/PD
11-6665-232-12	Operator and Organizational Maintenance Manual; Radiacmeter IM-174A/PD

5. Graphic Training Aids (GTA)

3-1-5	M13 Individual Decontaminating and Reimpregnating Kit
3-1-7	CBR Decontaminants

6. Training Films

TF 3-3338	Basic Principles of Radiac Instruments
TF 3-3753	Unit CBR Decontamination
TF 3-3858	M15A2A Chemical Agent Detector Kit
TF 3-3966	Individual Protection Against C&B Operations and Nuclear Warfare
TF 3-4238	NBC Reporting System
TF 3-4614	Planning and Conducting CBR and Nuclear Defense Training
TF 3-4800	Alarm, Chemical Agent, Automatic Components (B&W)
MF 39-5103	Atomic Weapons Orientation, Pt V
MF 39-9971	ADM (DASA)

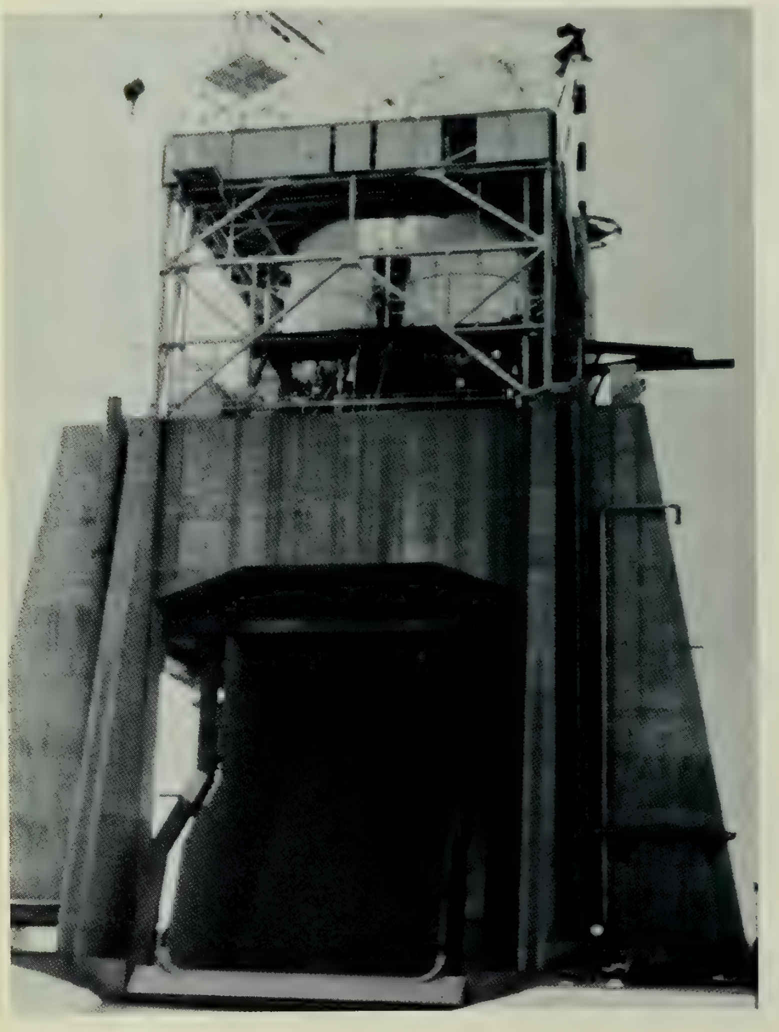
7. Videotapes

010-031-0016	Components of the M17A1 Field Protective Mask
010-031-0017	Accessories of the M17A1 Field Protective Mask
030-031-0013	Dressing Procedures for Permeable Clothing
030-031-0014	Undressing Procedures for Permeable Clothing
030-031-0021	Radiac Instruments — Part I, Tactical Dosimeters

The Corps and the Space Shuttl

Frank D. Lewis
George G. Stewart

Figure 1



The Corps of Engineers through its Huntsville Division continues to perform as a member of the team enbling America to continue its exploration of outer-space through the Space Shuttle Program.

Working with the Marshall Space Flight Center of the National Aeronautics and Space Administration (NASA), the Huntsville Division is putting the finishing touches on modifications to the Agency's testing facilities at the National Space Technology Laboratories (NSTL), near Bay St. Louis, MS.

Four separate construction contracts totaling nearly $20 million administered by the Corps of Engineers have transformed the NASA test facilities originally constructed by the Corps in the mid-60's for the Apollo moon landing program into testing facilities adapted to the reusable space shuttle rocket engines.

Three separate test stands have been involved. Two of the stands have been modified for single engine tests of the reusable hydrogen fueled space shuttle main engines. One of the two stands (Figure 1) is designed to simulate low altitude flight and the other (Figure 2) to simulate high altitude flight. The test stand designed for high altitude testing differs from the other in that the engine is mounted at an angle of 18° from the vertical and by the addition of a diffuser system through which the engine exhausts. The diffuser system serves to reduce the back pressure of the engine exhaust, thus simulating high altitude conditions.

Other modifications to the single engine test stands included installation of vacuum jacketed liquid hydrogen and liquid oxygen fuel and oxydizer tanks and thrust measuring systems.

Program

Extensive piping and work platform revisions were also involved.

The third test stand modification (see Figures 3 and 4) involved the test stand originally utilized in acceptance testing of the giant first stage of the Saturn rockets. In support of the space shuttle program this facility will be utilized in testing of the main propulsion test article which consists of a flight-type fuel and oxydizer tank and a cluster of three hydrogen fuel engines. Extensive structural revisions were required to accommodate the main propulsion test article.

The entire upper 100-foot superstructure of the test stand above the existing booster support frame, along with a portion of the existing booster support frame was removed. These areas were completely rebuilt to the new configuration required for the main propulsion test article.

In developing their approach of the required modifications, Industrial Contractors, Inc., Idaho Falls, Idaho, the successful bidders on the three contracts requiring modifications to the test stands, made extensive use of off-site fabrication. An existing canal system provided water transportation to each of the three test stands to be modified. This enabled large structural components to be completely assembled by off-site fabricators, shipped to the job site by barge and lifted into position on the test stands. The construction contract provided for the contractor to utilize the existing derricks mounted on the top of the test stands. This provided capacity for structural sections weighing up to 200 tons to be set in one piece. Piping, platforms, ladders, etc., not installed on the structural sections of the fabricator's shop were installed on the ground level before lifting the sections into position on the test stands. Major lifts often required planning

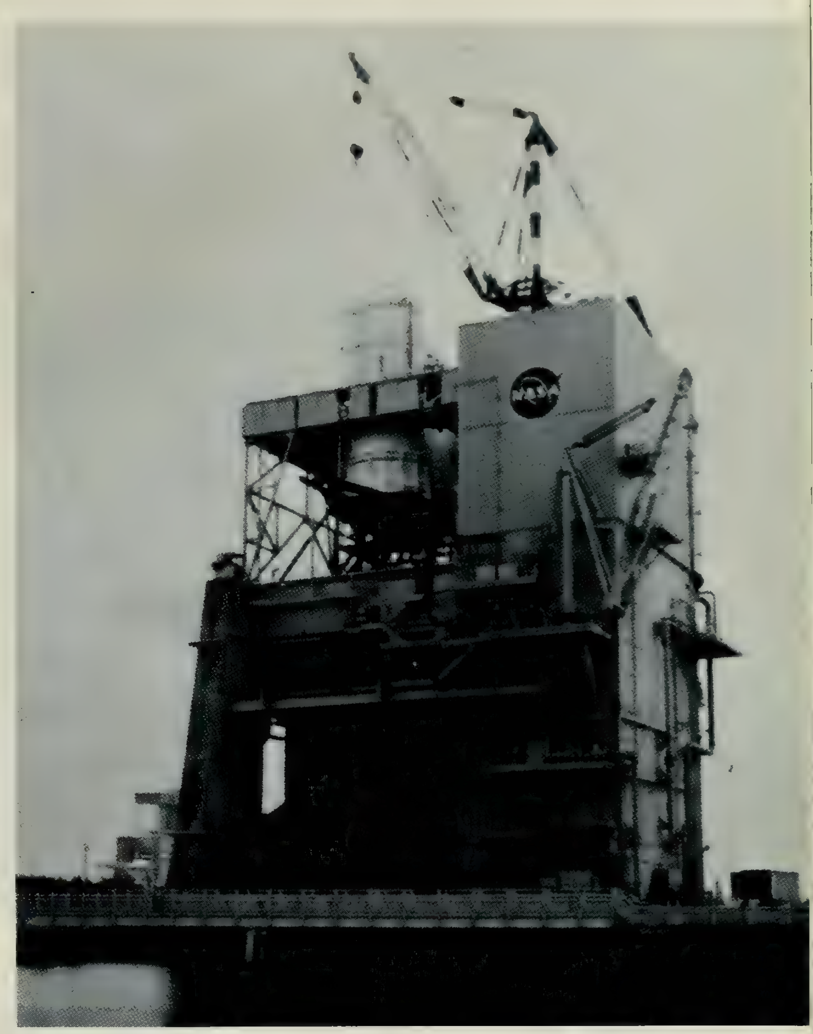
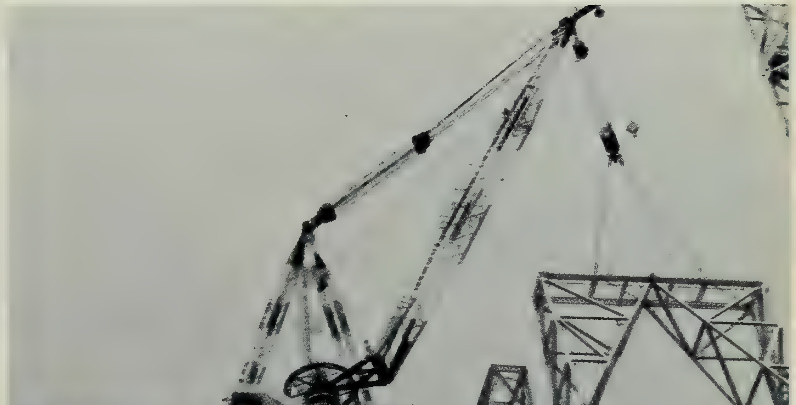


Figure 2

Figure 3



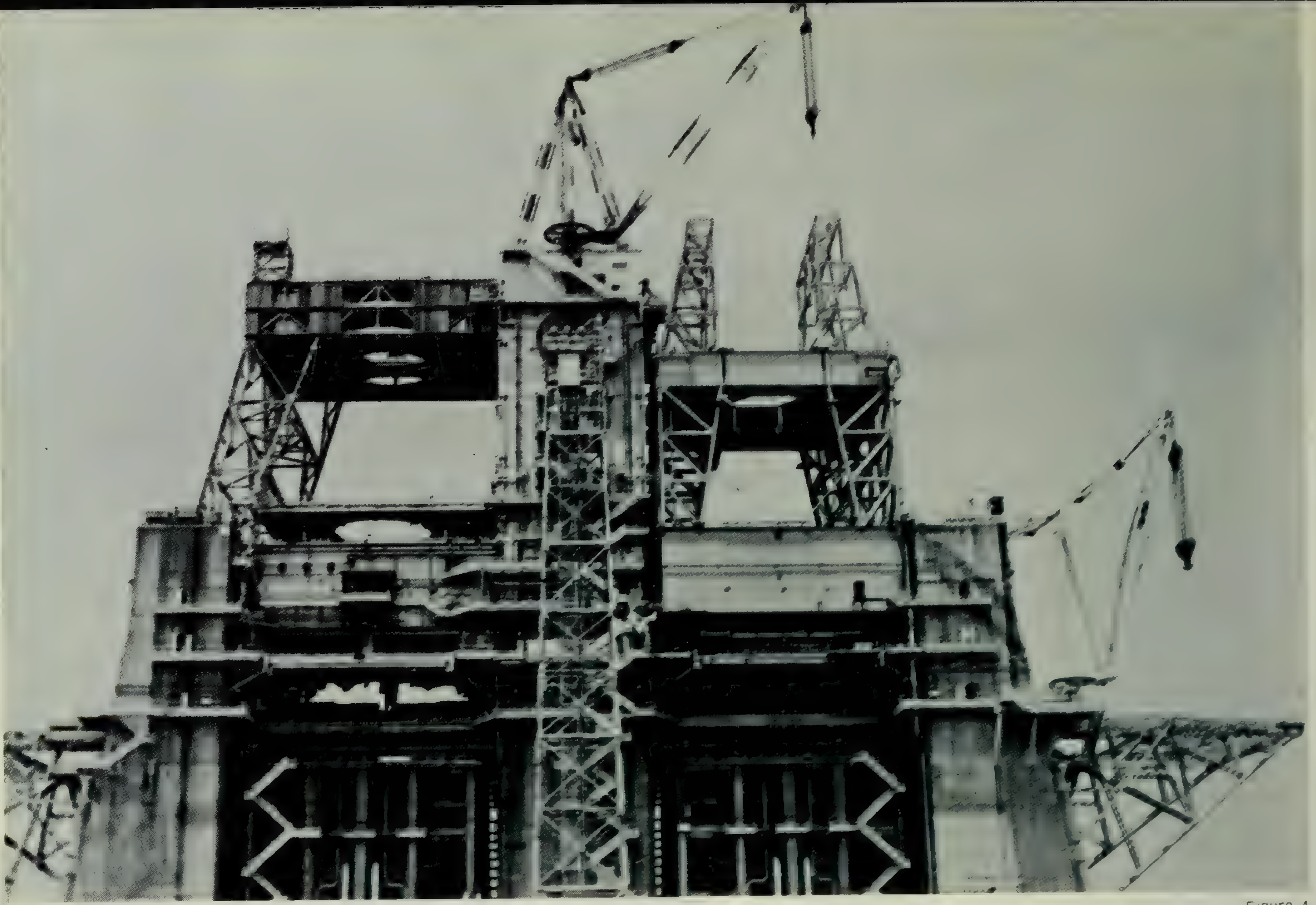
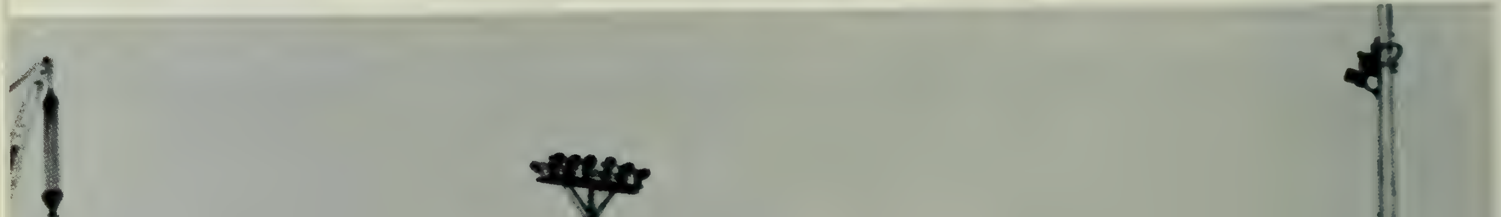


Figure 4

Figure 5



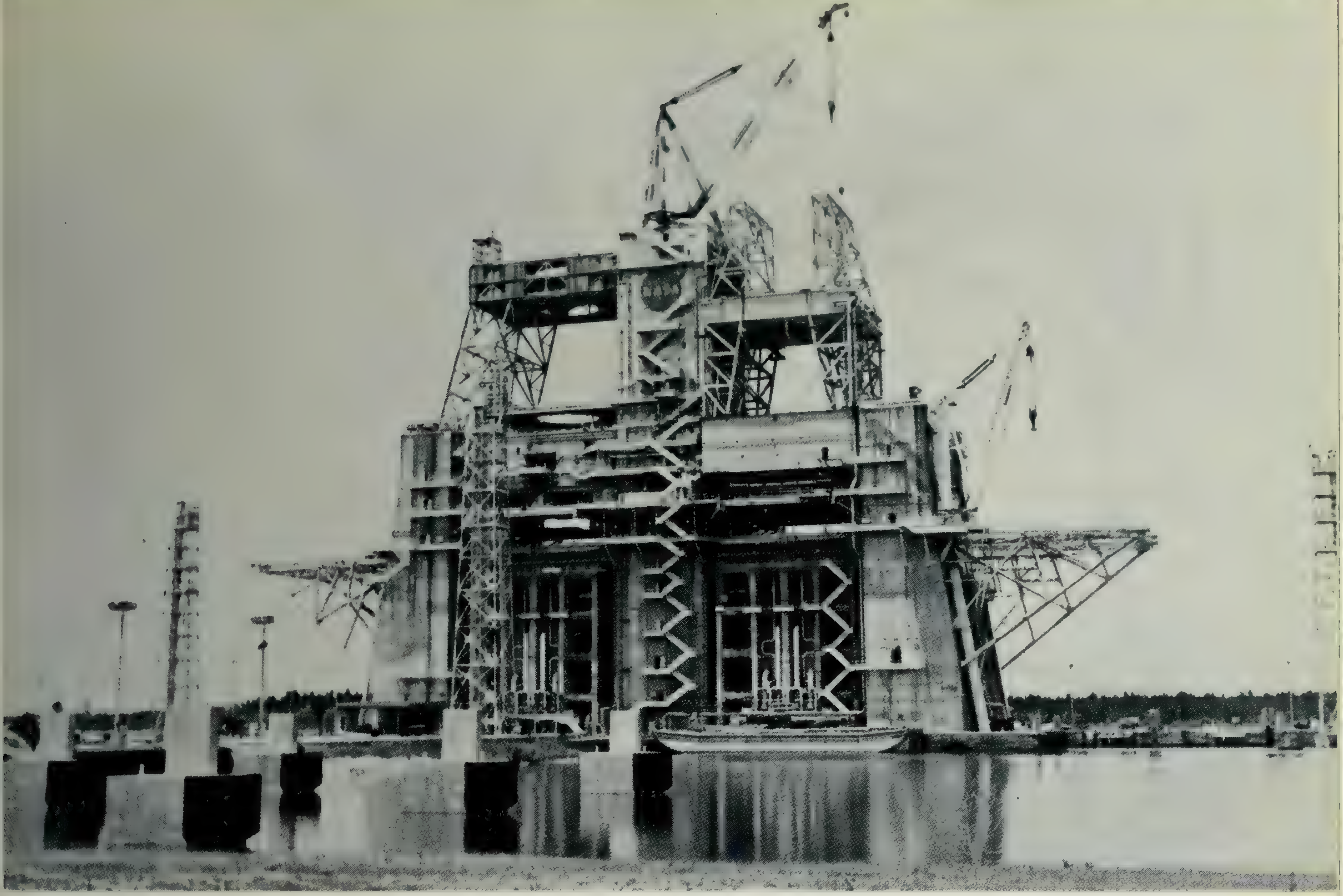


Figure 6

beginning several weeks in advance of the lift due to complicated rigging, narrow clearances, etc. Derricks, load slings, etc., were load tested before major lifts.

The fourth contract consisted of providing docking facilities for liquid hydrogen barges and associated hydrogen transfer facilities (Figures 5 and 6). The contractor on this project, elected to build the docking facility on dry land. Upon completion of the dock the canal basin was enlarged by dredging material away from the dock and the surrounding area.

As might be expected on any remodeling project, numerous problems arose in mating the new construction with the existing structure. The situation was further compounded by NASA subcontractors performing maintenance and refurbishment in the same general area as the new construction. Often work was in progress simultaneously on the same system by two or more contractors. A team concept developed involving NASA, the Corps of Engineers, and contractor personnel. Channels of communication between agencies remained constantly open enabling work to progress with minimal interference. In many cases NASA, the Corps of Engineers, and contractor personnel have pooled available resources to complete a critical item of work in a timely manner.

As engine development progressed, test criteria changed accordingly. For example, as engine specifications neared finalization it was determined that test stand fuel and oxydizer cleanliness was much more critical than was originally specified. As criteria changes were received from NASA, the Corps of Engineers and contractor management immediately arranged the necessary contract modification in order that work might proceed without delay.

The success of the team effort is reflected in the two single engine test stands on which space shuttle engines are currently test fired almost daily and the third test stand, where modification work is on schedule, to be transferred to NASA in September 1976.

Frank D. Lewis, Huntsville Division, US Army Corps of Engineers, is Area Engineer, National Space Technology Laboratories. He is a 1959 graduate of the University of Missouri at Rolla with a BS in Mechanical Engineering.

George G. Stewart, Huntsville Division, US Army Corps of Engineers, has been with the Division Public Affairs Office since shortly after its organization in October 1967. He has been Division Public Affairs Officer for the past four years.

Ribbon Bridge

Sparks the

Sp4 David C. Manchester

Fastening together sections of one of the Army's new Ribbon Bridge, the third platoon of Belvoir's 902d Engineer Company worked in sweltering heat July 1 of this year to complete the bridge in Washington, D.C.'s famous Tidal Basin.

Amidst the backdrop of historical landmarks, the 902d assembled the bridge to serve as a launching platform for the district's bicentennial fireworks display July 4.

According to Major Peter J. Mackie, Belvoir's senior bridging instructor, the new bridge has only been in service since the first of the year, and consequently provided the 902d with some good training, and the chance to implement "untried" techniques.

David C. Manchester is an Army journalist currently assigned to the Public Affairs Office at the U.S. Army Engineer Center and Fort Belvoir in northern Virginia. A graduate of the Defense Information School at Fort Benjamin Harrison in Indianapolis, he was first involved in broadcast journalism upon arrival at his Fort Belvoir assignment. He is presently writing for the post's newspaper, The Castle.

Bicentennial

AN ISLAND FOR CHILDREN

Sp4 Gayle Manchester

Putting their skills into operation, members of the 497th Engineer Company (Port Construction) from Ft. Eustis, Virginia, are building two bridges for the National Children's Island in the Anacostia River, Washington, D.C.

When completed, National Children's Island will be a national center for children's activities where children of all ages can roam and play at will.

The 40 enlisted men and one officer working on the bridge project include welders, surveyors, mechanics, pipe line specialists, carpenters, heavy vehicle operators, boat crewmen, crane operators and riggers.

The 497th came prepared with machinery. Their hardware includes a pile driving barge with a skid-mounted pile driving rig, a 40 ton crane with pile driving leads, a trailer-mounted woodworking shop and a bridge erection boat.

The project benefits everyone. It gives the Army training materials; gives Children's Island an opportunity to build the park; gives the children a park, and gives the men the training.

Most of the 40 member party is comprised of the 2d Platoon of the 497th. Moral is high. This is a good environment to work in, and "it provides an opportunity for the men to see D.C. in their free time.

Once assigned to Ft. Belvoir, the 497th was moved to Ft. Eustis in March, 1973. The engineers expect to finish the project in December.

Gayle Manchester is an Army information specialist currently assigned to the Public Affairs Office at the U.S. Army Engineer Center and Ft. Belvoir in northern Virginia. She is a graduate of the Defense Information School at Ft. Benjamin Harrison, Indiana, and is currently writing for the Ft. Belvoir post newspaper, The Castle.

200 Years

Part 1

MAJ Matthew J. Jones

"Two Hundred Years of Military Engineering . . . a Foundation for the Future." That is the Bicentennial Theme adopted by the Society of American Military Engineers. Indeed, it is a most appropriate theme, for the military engineer has done much for his nation.

If one were to make even a rather hurried trip along the highways of history, he could not help but see the splendid panorama fashioned by the contribution of military engineering to the foundation, growth and sustainment of these great and blessed United States of America.

Many say that George Washington was the father of our country. Certainly he contributed much to the formation of the new nation whose 200th Anniversary we now celebrate. Soldier, statesman, surveyor — and engineer — he recognized the importance of the engineer in safeguarding and building a nation. Thus, he can justifiably be pointed to as the father of military engineering for the 13 colonies.

Shortly after "the shot heard round the world" was triggered at Concord Bridge, he took action to

Military Engineering:

insure a military engineering capability for the Continental Army. One of his first actions as Commander-in-Chief was to request the Second Continental Congress to authorize a Chief Engineer for the Continental Army. Congress acceded to this request and General Washington appointed Colonel Richard Gridley on 16 June 1775 — the day now recognized as the founding date of the Army's Corp of Engineers. On the very night Colonel Gridley was appointed he actively undertook the fortification of Breed's Hill while under fire from His Majesty's Ships Lively and Falcon. These fortifications played a large part in allowing a small force of untrained militia to inflict significant casualties upon the elite of the British Army at a much smaller cost in American casualties.

Due to the character of the warfare of the times, military engineering efforts during the Revolutionary War were devoted principally to the erection of defensive fortifications. Engineering talent, however, was scarce. General Washington constantly complained to Congress about the critical shortage of engineers. In answer to his pleas Congress passed a resolution in December 1776 which authorized him to raise a Corps of Engineers.

Legislation alone, however, failed to produce competent engineers from a population which had none. Therefore, in January 1777, Benjamin Franklin, long famed for his interest in matters of both civil and military engineering, appealed to the French Court for assistance in the form of King's Engineers. The king agreed and directed his Minister of War to select a cadre of engineers to aid his American allies.

Captain Louis le Beque du Portail was placed in charge of this cadre and became, with the rank of Brigadier General, Chief Engineer of the Continental Army in July 1777. And so it was, that General du Portail with an organization of foreign engineer officers such as l'Enfant, Rochefontaine, and Kosciusko, gave the struggling colonies the engineering expertise needed to support an army.

Without the engineer-built fortifications at Valley Forge, the British would have ended the American Revolution there. And, it was the brilliant contribution of the siege works before Yorktown that contributed so much to the unconditional surrender of General Cornwallis and brought the American Revolution to a successful conclusion for the colonists in October 1781.

Two years later the Corps of Engineers was disbanded. From then until after the inauguration of the government under the Constitution of 1789 nothing occured which required the use of military engineers. The pressure of relations between the new nation and the principal powers of Europe, however, caused Congress in March 1794 to authorize the President to fortify certain harbors along the coast. As there were no engineers in the Army, the President directed the temporary appointment of a number of engineers to design and supervise the construction of the works. Most of these men were foreign-born and had been in the Corps of Engineers of the revolutionary Army.

In that same year, 1794, Congress provided for a Corps of Artillerists and Engineers to be employed in the field, on the frontiers and in the fortification of the sea coasts. Concurrently, a military engineering school was organized at West Point, a recommendation which had been made by General du Portail over 10 years earlier before his return to France.

In January 1800, Secretary of War James McHenry urged the revival of the Corps of Engineers as a separate branch and the establishment of a formal Military Academy. Congress heeded the Secretary's urgings and in March 1802 with President Jefferson's consent organized a Corps of Engineers, and a Military Academy in its charge, both to be stationed at West Point, New York.

The Academy was dedicated to military training and academic excellence. For 22 years after its founding it was the only engineering school in the country. Its superintendents realized that the technical education there must include courses that would produce officers capable not only of building seacoast fortifications but capable of undertaking the exploration, surveys and civil works so necessary to develop a nation.

One superintendent in particular, Sylvanus Thayer, recognized that one engineering school at West Point could not produce the vast army of engineers the country would need during the coming years. He preached that additional technical schools must be established. He believed that without a great army of civilian engineers our national resources would be slow of development. He also believed that, if war came, this great army of engineers would cooperate with the Army. The future would justify his beliefs.

The Louisiana Purchase of 1803 doubled the territorial holdings of the United States. President Jefferson recognized the need for increased knowledge of the trans-Mississippi region in order to evaluate the unknown territory for settlement and subsequent development. Lewis and Clark were to help close the gap of ignorance. Between 1804 and 1806 these two officers conducted their expedition. For the first time the immense distance and geographical diversity of the area between the Mississippi and Pacific were known. Their journey, followed by Major Stephen Long's expedition to the Rocky Mountains in 1819 and 1820, began a program of exploration and mapping across the Great Plains, over the Rockies and down the Great Columbia River to the Pacific. By mid 19th century, these and other expeditions had charted the major features of central North America. Many of these expeditions were conducted by the Corps of Topographical Engineers which was a separate entity until merged with the Corps of Engineers in 1863.

One of the most impressive and durable monuments to our nation's continual expansion, the Cumberland National Road, begun in 1811, might also be considered a monument to the military engineer, for it was he who translated the dream into reality. Today's travelers along US Highway 40 probably do not realize that they are following the historic route of the once-famous national road.

Between 1806 and 1811 military engineers designed and supervised the construction of 24 forts and 32 coastal batteries, such as those at Fort Jay, New York; Fort Harrison, Indiana; Fort Union, Delaware; and Fort Severn, Maryland, now the site of the US Naval Academy. Not a single fortification constructed during this period fell to the British during the War of 1812 even though many were subjected to heavy attack. The War of 1812 was, due to these fortifications, largely a sea war. What land battles were fought, succeeded or failed in large measure on the adequacy of the defenses constructed.

At the conclusion of the war, work on coastal fortifications was renewed. Their value had been demonstrated in the war and their absence severely felt at many points of the seaboard. In November 1816 a Board of Engineers for Fortifications, with both Army and Navy representation, was established to locate, plan and execute works of fortifications. From their efforts came forts like Hamilton, Monroe and Sumter.

By congressional act of 30 April 1824 military engineers were authorized to conduct ". . . the necessary surveys, plans and estimates . . . of the routes of such roads and canals as he [the President] may deem of national importance in a commercial or military point of view, or necessary for the transportation of the public mail, designating, in the case of each canal, what parts may be made capable of sloop navigation . . ." Thus, did the Corps of Engineers embark on its civil works function and begin in earnest the long line of contributions to national expansion and development. Military engineers made surveys for work on the early canals and railroads, built roads, made the Ohio, Missouri and Mississippi safe for navigation, opened up harbors for steamships on the Great Lakes and built and maintained lighthouses necessary for safe navigation. All of these were done by military engineers, officers and civilians, for there had been no engineer troops units in the Army since January 1821.

It was mid-1846 before an engineer troop unit would again be established. When the war with Mexico was joined, one company of sappers, miners and pontoniers was added to the Army. This unit later became and is carried on the roles today as the 1st Engineer Battalion. Much of the credit for our victories in Mexico went to the military engineers who comprised the 1st Engineers. They improved poor and impassable roads and constructed new roads which gave the Army the mobility it needed to reach its goal of victory. They also directed the siege operations at Vera Cruz, Cerro Gordo, Chapultepec and Mexico City which resulted in their capitulation. This war proved to be a training ground for many leaders of the Civil War. The roll reads like a prolog to later times and places: Lee, McClellan, Beauregard, McPherson, Tower and Halleck — all were military engineers.

With victory in the Mexican War, the continent was at last contained. The delineation of the national domain was to be followed by its development. Transcontinental railroads were needed to tie the Atlantic to the Pacific. Military engineers, thus, became involved in yet another project to shape the nation — surveying and building railroads. For some of them — like Grenville Dodge — new careers emerged. Thirty-five engineers left the Army and became railroad presidents and an even greater number became Chief Engineers for railroad companies.

If the American Revolution can be construed as the conception of a new nation, then certainly the American Civil War can be viewed (as did one early motion picture producer) — the birth of a nation. On 12 April 1861 the heavily stressed warp and woof of national unity was deeply rent by the Confederate States of America's firing on Fort Sumter in Charleston Harbor, South Carolina. The tragedy of war had struck.

During this herculean struggle, great armies were massed and moved over vast stretches of terrain. From the building of the defensive works of Washington on the heights of Alexandria to performing the tasks of sappers, miners, pioneers and pontoniers with the armies in the field, military engineers proved indispensible to the great commanders on both sides. Their special assignment was to the charge of the bridge trains that accompanied the armies.

The floating bridges constructed were without parallel in number and magnitude, attaining lengths of 2,000 feet or more, and included repeated crossings of the Potomac, Rappahannock, Chickahominy and James Rivers, against drift, ice and strong currents. In seven hours military engineers threw a 2,100 foot bridge across the James River comprised of a 150 foot trestle with a floating section of 101 pontoons.

While supporting Sherman's advance from Chattanooga to Atlanta, military engineers were required, during a three month period, to rebuild 12,300 feet of railroad bridge. One of these bridges was 2,100 feet long and required 170 bents. At the same time they repaired or reconstructed some 115 miles of track.

Military engineers took part not only in the sieges conducted during the war, they also provided the means for the logistical support of those operations by constructing and repairing roads, trestles and crib bridges. The war introduced new combat applications. There were telegraphy for faster communications, the employment of aerial balloons for aerial observation and new weapons and tactics. Both sides used railroads for the movement of men and supplies with new speed and efficiency. The war changed not only the nation, but also the ways in which future wars would be fought.

After the Civil War, military engineers returned to their projects of managing America's water resources, directing surveys to further national expansion and constructing public buildings. The city of Washington was in need of much attention. Conditions were so bad that some wanted our capitol site moved elsewhere, but military engineers went to work finishing what had been started in the capitol city. They laid out the grounds for Arlington National Cemetery, paved streets, constructed aqueducts and directed the construction of the wings and dome of the Capitol Building, the original Library of Congress and completion of the Washington Monument.

The push to the west strengthened during the post war period. Military engineers mapped the Yellowstone area and aware of man's propensity for destruction asked Congress to build roads and establish Army Patrols to preserve and protect the park, decades before the National Park Service was established. Congress agreed and sent military engineers to lay out a highway system in the park which still exists in the park's roadway network. Yosemite and Sequoia Parks in California were also kept safe from exploitation and abuse by military engineers until the National Park Service assumed that responsibility.

America was growing quickly — and so were her needs for transportation. Military engineers changed the ways in which scientists and engineers throughout the world would study, manage and establish controls for stream, lake and river management. Concerted effort was directed to the Mississippi, Arkansas, Missouri and Ohio Rivers to make them both navigable and safe for the people settled near their banks. In the Great Lakes chain a stubborn, natural barrier in the rapids at Ste Sault Marie had to be overcome to open the 1,000 mile long shipping route to serve our expanding waterway commerce system. Harbor improvement in our port cities also fell to the skill of military engineers.

When Ferdinand DeLesseps abandoned the 50 mile Panama Canal in 1889, after seven year's work and the deaths of 22,000 workers, American military engineers stepped in and completed the project. In August 1914 Colonel George Goethals succeeded in completing what the builder of the Suez Canal found impossible. The locks, dams, breakwaters, dredged channels, power plants, docks, piers, fortifications were incredible engineering feats. But one of the major engineer accomplishments was the sanitary engineering undertakings which were essential to the construction effort. The canal stands to this day as a monument to the determination, courage and engineering ability of America's military engineers.

The noise of the men and equipment that constructed the Panama Canal was soon replaced by the awful roar of the Guns of August. Although it would be almost three years, until July 1917, before America entered the war, the holocaust of World War I had engulfed Europe in August 1914. The military engineer was called to the test as never before.

Gone were the days of snatching a musket off the wall and going off to fight. The day of large-scale mobilization had dawned. Training and marshalling camps, defense plants, warehouses, depots and terminals were needed to amass, train and dispatch an army of over 1-million men. In 16 weeks the military engineer was directed to complete cantonments at 32 locations for this army. The challenge was well met. By war's end in November 1918 military engineers had directed the construction of 32 camps for one and three quarter million men, four ports of embarkation, 22 training centers, 77 aviation facilities, 89 hospitals, 125 depots plus numerous other posts and stations.

In the war zone 296,000 military engineers, a force twice the size of the regular army at the start of the war, were involved in supporting combat operations. The 11th Engineer Regiment, which exists today at Fort Belvoir as the 11th Engineer Battalion, suffered the first American casualties of the war while working to clear a passage through no-man's-land prior to an allied assault. Military engineers worked hard in the lines and behind the lines to build hundreds of bridges; to repair and construct roads, railroads, airfields and port and harbor facilities; to erect hospitals, depots, tank farms and cantonments; and to provide water and utilities.

The war to end all wars concluded in 1918. Military engineers had responded magnificently to the demands of the war and in so doing had proven their essentiality to the successful conduct of modern warfare.

CONTINUED NEXT ISSUE

Major Matthew J. Jones, Jr. is assigned to the Office of the Deputy Chief of Staff for Operations, HQDA. A civil engineering graduate of the University of Detroit, he was commissioned in the Corps of Engineers in 1962. Since then he has served with the 326th Airborne Engineer Battalion; the 8th Engineer Battalion, 1st Cavalry Division; the 2d Engineer Battalion, 2d Infantry Divison; the US Army Support Command-Vietnam; MACV; Test Command, Defense Nuclear Agency; and the US Army Engineer School. Major Jones has a Masters Degree in civil engineering from Stanford University and is a graduate of both the Engineer Officer Advanced Course and the Command and General Staff College.

QUIZ TIME

Engineer Staff

Okay Sappers, it's quiz time! Sharpen up your pencils and put on your thinking headgear. Concentrate, now, and give it all you've got, because if you miss more than two, you have to go back and re-read the entire Engineer Field Data Manual, FM 5-34.

Don't get nervous. Ready? Let's get started:

1. What is the wheeled and track capacity for an 80% double-single Bailey Bridge during a normal crossing?
2. What is the symbol for an anti-personnel mine?
3. In quarry operations, the borehole pattern is governed by (choose one or more of the following):
    - a. The energy created by the explosives
    - b. The amount of tamping in the borehole
    - c. The diameter of the explosive charge
    - d. All of the above
4. How many hours are required to construct a two-man foxhole with half cover, completely reveted with corrugated metal, using D-handled shovels and ordinary carpenter tools?
5. What formula is used to compute the amount of TNT for cutting I-beams, build-up girders, and steel plates?
6. In special bridge crossings, which of the following statements are true?
    - a. Only the division commander or higher can authorize a risk crossing.
    - b. A class 36 vehicle crossing a class 30, one-lane timber trestle bridge would be a caution crossing.
    - c. A risk crossing can be made only on a Bailey Bridge.
    - d. In a risk crossing, a vehicle may not exceed 3 MPH.
7. A 3-2-1 picket holdfast in wet clay and gravel has a capacity of how many pounds?
8. What is the minimum safe distance for personnel in the open with bare charges using 40 pounds of explosives?
9. What value as a subgrade beneath-landing mat or as an unsurfaced area would a poorly graded gravel or gravel and sand mixture, with little or no fines provide? Choose one:
    - a. Poor
    - b. Fair to Poor
    - c. Good
    - d. Very good to excellent depending whether it was wet or dry.
10. Calculate the runway for a C-130 aircraft in a forward area using the following conditions:
    - a. Altitude: 3000 feet
    - b. Mean temperature: 40 degrees
    - c. Effective gradient: 3%
11. True or false: The first cluster in a strip is always an omitted cluster.

12. If 30 pounds of TNT were required for a demolition project, how many pounds of M-118 sheet explosive would be required for the same project (disregard explosive package size and round off rule)?

How many pounds of C-4 would be required for the same project?

13. What would be the required length of a ¼ Wave Antenna at 56 megacycles?

14. How many sets of Aluminum Footbridge would be required to make nine, ½-ton capacity expedient rafts?

15. Which of the following statements are true about minefield reports?
Choose one or more:

- **a.** DA Form 1355 is used for preparing a record of a friendly minefield and DA Form 1355-1 is used for preparing a record of an enemy minefield.
- **b.** DA Form 1355 is classified confidential when filled in.
- **c.** DA Form 1355-1 is unclassified when filled in if the minefield is temporary in nature.

16. Calculate the size and number of TNT charges required to breach a reinforced concrete wall that is 30 feet long and 6 feet thick. Use external charges placed at ground level and tamped.

17. In the same situation as for question 16, will the blast cut the reinforcing steel?

18. True or false: The maximum length of a shear leg is 60 times the diameter of the leg.

19. In classifying a timber trestle bridge, compute the number of effective stringers (N2) for two-way traffic using a total of 13 stringers.

20. What is the spacing of the long pickets in a Six and Three Pace Double Apron Fence?

21. What surface run off factor would be used for an impervious soil with turf a slope of 4%?

22. What is the maximum number of antitank mines that can be in one cluster? Choose one:
- **a.** It depends on the minefield density.
- **b.** 2
- **c.** 1
- **d.** If no antitank mines were used in the IOE, then no antitank mines could be used in the strip cluster compositions.

23. What is the minimum width for a one-lane bridge designed to carry class-30 vehicles?

24. In concrete construction, what is the potential mixer output (cu yd/hr) for a 16S mixer using a batch time of 3 minutes (mixer yield is 16 cu ft)?

25. What classification does a five-bay Mobile Assault Bridge have in a stream velocity of 6 FPS?

26. Using a M3 shape charge, what is the average diameter size of the borehole in reinforced concrete that it will make when detonated?

27. Which of the following knots is used to shorten rope or take the load off a weak spot in a rope? Choose one:

- **a.** Sheepbend
- **b.** Square knot
- **c.** Bowline
- **d.** Sheepshank

28. What is the minimum cover for a culvert? Choose one:

- **a.** ½ diameter of the culvert or 8-inch minimum
- **b.** 1½ diameter or 12-inch minimum
- **c.** ½ diameter or 12-inch minimum
- **d.** Twice the diameter

29. Calculate the amount of explosives needed for a test shot on a tree, 24 inches in diameter, using a tamped internal charge (military dynamite is available).

30. What is the maximum effective range for the following weapons?

a. 66mm Heat rocket, M-72 (LAW)
b. an 8-inch artillery gun
c. M18A1 Claymore Mine

31. What is the weight per cubic foot of set portland cement?

32. True or false: The bridge classification of a timber trestle bridge is determined by the structure.

33. Which of the following statements are true about the placement of trip wires in a minefield? Choose one or more:

a. There can only be one trip-wired mine per cluster and no closer than every fourth cluster.

b. Only antitank mines are trip-wired.

c. Trip wires are used only in the row on the enemy side of the strip centerline.

d. A trip wire from one cluster must be out a minimum of 2 meters from another cluster on the enemy side of the strip centerline.

34. An M4T6 reinforced float bridge across a 350 foot span in a stream velocity of 7 FPS will require what size single cable for an overhead cable bridle line?

35. How many pounds of explosives are in an M-19 Plastic Heavy Antitank Mine?

ANSWERS

1. 50/55
2. ✓
3. a, c
4. 8 man hours
5. P = 3/8 A
6. b, d
7. 3600 pounds
8. 1020 feet
9. d
10. 3300 feet
11. False
12. 26.3 Pounds M118 Sheet Explosive; 22139 Pounds C-4
13. 4.2 Feet
14. 3 Sets
15. c
16. 272.5 Pounds TNT; 3 charges
17. No
18. False
19. 4.875 stringers
20. 6 paces
21. .50 to .75
22. c
23. 11 Feet, 0 Inches
24. 11.9 cubic yards.
25. Class 75
26. 3½ inches; at least 20 inches
27. d
28. c
29. 2½ Pounds
30. a) 200 meters b) 16,800 meters c) 50 meters
31. 183 pounds per cubic foot
32. False
33. c, d
34. 1 Inch
35. 21 Pounds

BRIDGING

AVIATION CMF REDESIGNED UNDER EPMS

There are some big changes in store for the 17,500 soldiers in the highly skilled Aviation Maintenance career management field (CMF 67). A redesign of the CMF recently was approved by DA for implementation under the Enlisted Personnel Management System (EPMS). Sixteen MOSs will replace the current 22:

- There will be one fixed wing repairer, MOS 67G (Airplane Repairman); MOSs 67B, C and H will be deleted from the MOS inventory.
- Helicopter repair MOSs are changed — soldiers now will be trained to maintain categories of helicopters — 67V (Observation/Scout), 67N (Utility), 67Y (Attack), 67U (Medium Lift), and 67X (Heavy Lift). This should make the opportunity for varied assignments better.
- Soldiers in MOS 67W (Aircraft Quality Control Supervisor) will be trained to perform inspection and quality control on both fixed and rotary wing aircraft. MOS 67F was consolidated into 67W.
- MOS 68D (Aircraft Powertrain Repairer) will include most of the duties of the current MOSs 68D and 68E.
- MOS 68K (Aircraft Components Repair Supervisor) has been created. Soldiers in this MOS will be capable of supervising the activities of all the aircraft component repairers.
- MOS 68J, entitled Helicopter Missile Systems Repairman, is a consolidation of the current MOSs 35J (Aircraft Fire Control Repairman) and 45J (Aircraft Armament Repairman).
- MOS 45M (Aircraft Armament Subsystem Mechanic) has been transferred from CMF 63 (Automotive Maintenance) and has been retitled 68M.

These changes will be announced in DA Circulars in the 611 series later this year and subsequently in a change to AR 611-201. The MOS changes along with the required modifications in training are scheduled to take place in 1977. Skill Qualification Tests (SQTs) and Soldier's Manuals will follow at a later date.

MOVEMENTS IN ACCORDANCE WITH ASSIGNMENT INSTRUCTIONS

MILPERCEN is reminding commanders and MILPOs that particularly during the summer peak movement months, soldiers must move during the arrival months specified on their HQDA Assignment Instructions.

As assignment instructions are sent to the MILPOs, MILPERCEN undates its appropriate Master files. If the soldier is unable to complete his PCS move during his scheduled arrival month — especially overseas — the MILPO must request either a deletion or deferment from MILPERCEN. Upon approval, the MILPO must contact the servicing Central Port Call Office to cancel the soldier's port call.

MILPERCEN is urging all installations to comply with the guidelines on deletions and deferments contained in Chapter 7 of AR 614-200. This will insure that movements flow smoothly throughout the year and that reserved seats on oversea-bound flights will be filled by other eligible soldiers.

UPDATED, COMPLETE DOCUMENTS FOR EMERGENCY LEAVE TRAVEL

Soldiers reporting at Aerial Ports of Embarkation without updated immunization records or the necessary "fund cites" listed on their PCS or emergency leave orders may incur delays which result in missed port calls.

Army regulations require that all personnel scheduled for transportation on military owned or controlled aircraft must possess these complete and updated documents; however, MILPERCEN's

THE GAP

Personnel Assistance Points have reported that many soldiers are arriving without them.

Paragraph 6-10 of AR 630-5 requires that travel in connection with emergency leave must be harged to the command authorizing the travel. Likewise, AR 40-562 requires immunizations to be btained before the soldier departs CONUS for an oversea area. The soldier also must carry a roperly stamped immunization record with him while in transit overseas.

Additional details on these requirements may be found in MILPERCEN message DAPC-MSF-M 11903Z July 1976.

verage EERWAs

The Army's Enlisted Records and Evaluation Center (EREC) has released the latest Army-wide nlisted Evaluation Report Weighted Averages (EERWAs) by pay grade. As of 30 June 76, the verage EERWAs are: E9, 123.28; E8, 122.09; E7, 119.89; E6, 115.74; E5, 109.91; E4, 102.67; E3, 7.29; E2, 76.04; and El, 59.54. Each soldier's EERWA is automatically computed and entered on the oldier's USAREC Form 10, Enlisted Evaluation Data Report, by EREC at Fort Benjamin Harrison, ndiana.

eptember Promotions Up

September promotions were up generally across the board from August totals. September romotion orders carried the names of 8,039 enlisted personnel, according to DA officials.

Enlisted promotions include 3,500 to E-5; 2,420 to E-6; 1,492 to E-7; 531 to E-8 and 96 to E-9. ollowing the September hikes, 7,801 names remain on the current E-7 list; 2,158 names remain on he current E-8 list while 90 are still on the E-9 list.

Promotions to E-5/6 are made from local lists per DA published monthly promotion cutoff scores or each MOS.

ateral NCO/Specialist Conversions Under EPMS

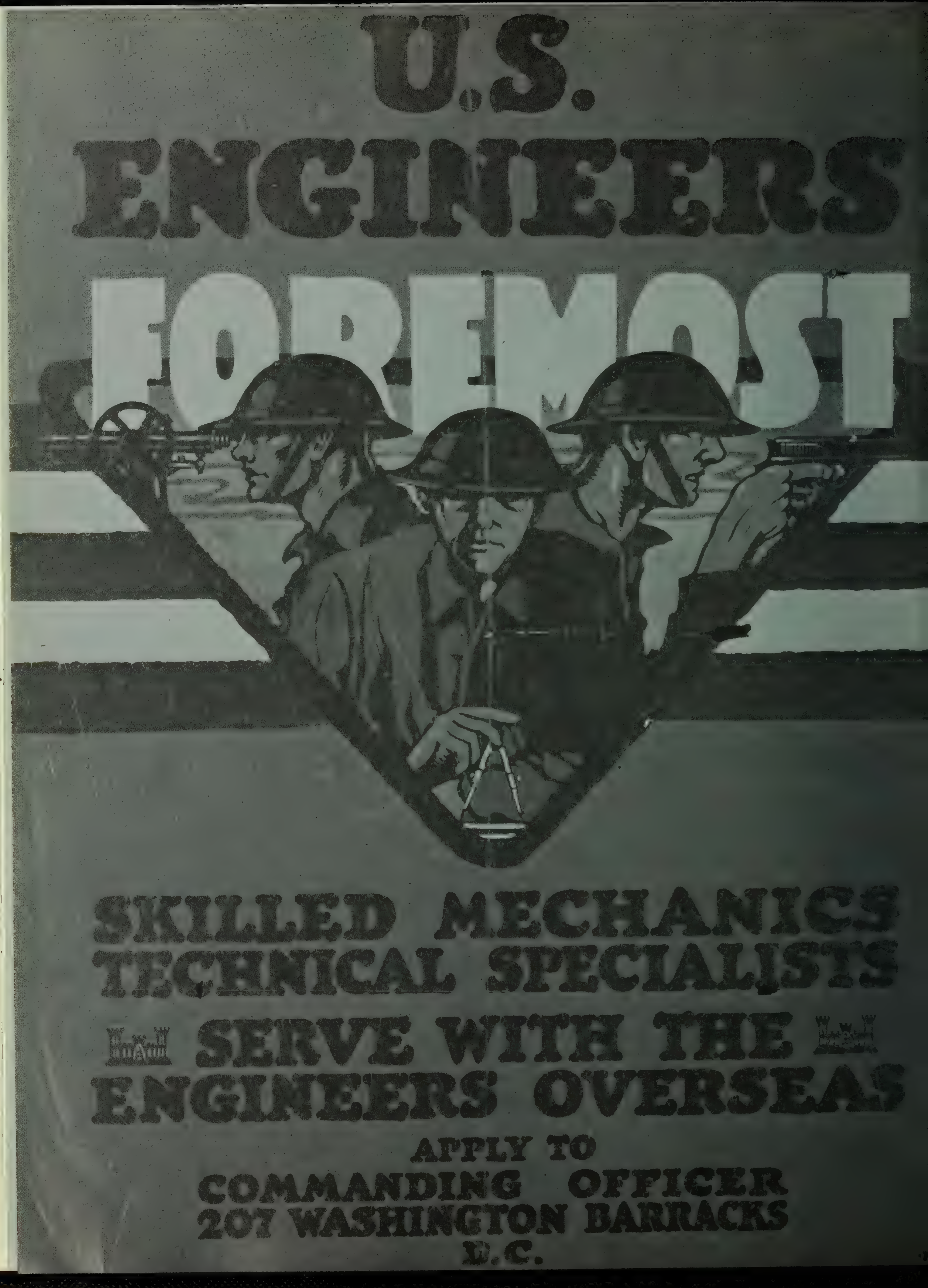
A realignment of grades and skill levels is taking place under the Enlisted Personnel Management System (EPMS) to give soldiers better career progression. This realignment will also conform with a revised Standards of Grade Authorization (SGA), according to MILPERCEN officials.

Since the SGA, which is set by law, does not permit both NCO and specialist ranks in the same MOS and skill level, some specialists will be converted laterally to NCO grades under EPMS while some NCOs will be converted to specialists.

The driving factor in determining whether NCOs or specialists should be authorized is the number of positions in the MOS and skill level which require leadership, supervisory or managerial responsibilities.

These conversions are based on Armywide MOS structure evaluations. MILPERCEN officials note that these evaluations are not a reflection on the soldier's manner of performance nor are they a factor in his or her professional development.

As an exception to the SGA's requirements, E-4s whose MOSs are under EPMS still may be appointed as corporals even though PMOS structures do not include NCOs in grade E-4 at the soldier's skill level. In this case, the soldier must have served successfully in the NCO position for at least 60 days, have the recommendation of his or her immediate commander, and meet the other prerequisites outlined in paragraph 7-53 of AR 600-200. This paragraph spells out the policies and procedures pertaining to lateral appointments and will be revised in the near future to reflect policies which pertain to the conversion of personnel under EPMS, MILPERCEN officials say.



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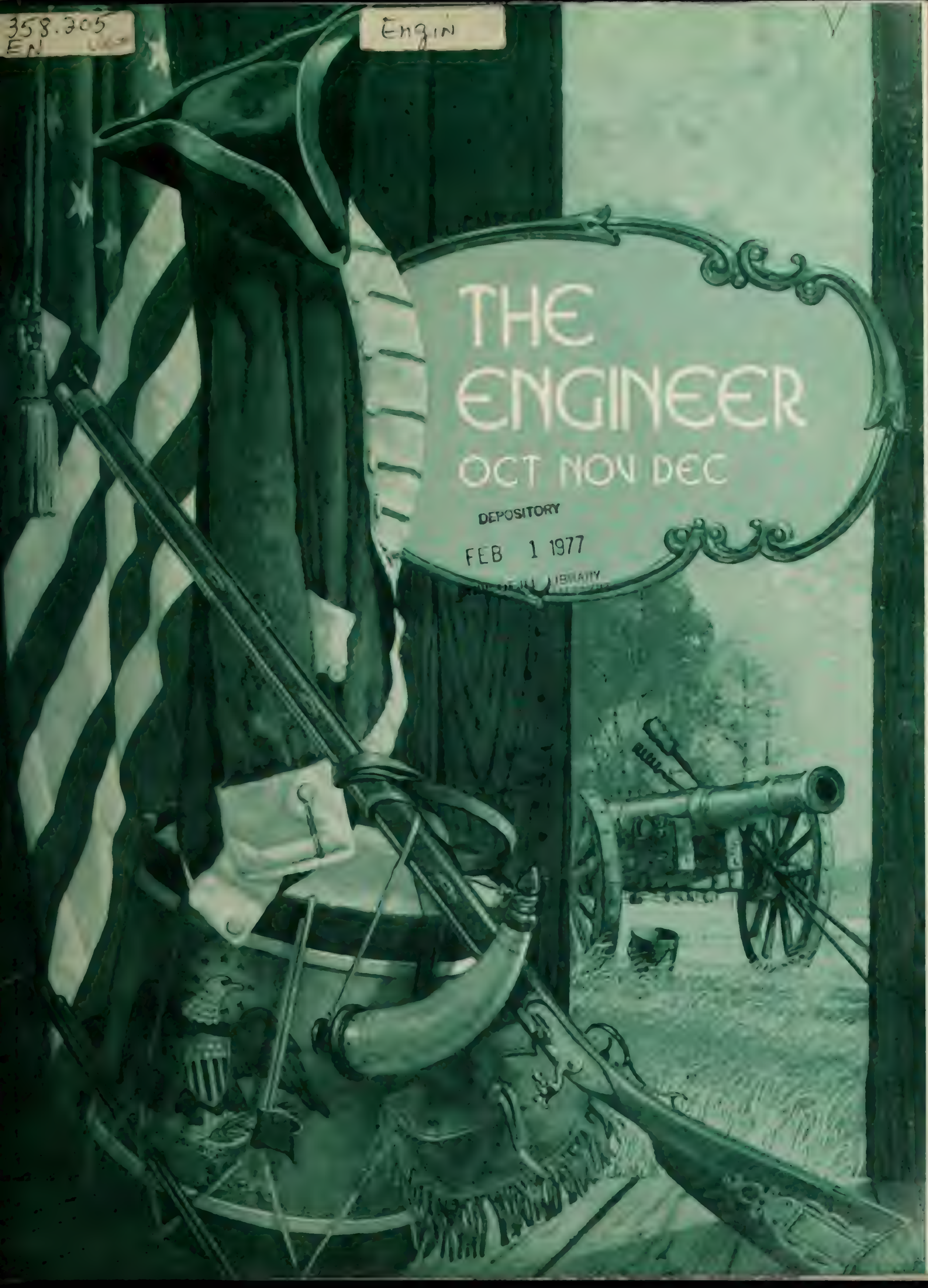

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CHIEF'S BRIEFS

Brigadier General Thomas Lincoln Casey was born at Sackett's Harbor, New York, May 10, 1831. He was graduated from the United States Military Academy on July 1, 1852 and promoted Brevet Second Lieutenant, Corps of Engineers.

Casey taught engineering at the Academy from 1854 to 1859. In 1859-1861 he commanded Engineer troops in Washington Territory.

During the Civil War Casey served on the Staff of the Department of Virginia and was entrusted with a variety of coastal fortifications responsibilities. For faithful and meritorious services he was brevetted Colonel on March 13, 1865.

Casey is best known as the Corps of Engineers most distinguished builder of public monuments and buildings. In this role he supervised from 1877 to 1888 the construction of the State-War-Navy Building and the completion of the Washington Monument. The latter project featured Casey's greatest engineering feat: the straightening of and placing of a new foundation under the monument, already 173 feet high.

While Chief of Engineers from July 6, 1888 to May 10, 1895, Casey, in addition to normal duties oversaw most of the construction work on the Library of Congress.

Prior to his death on March 25, 1896, General Casey served as a member of the National Academy of Sciences, the Society of the Cincinnati, and as an officer of the Legion of Honor of France. He was buried at the family farm in Rhode Island.

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ABOUT OUR COVER

We could not let this, the year of our Bi-Centennial, come to a close without one more relating cover. We think it is a fitting end for our article, "200 Years of Military History." Let's hope that when the United States has its Tri-Centennial that THE ENGINEER magazine will be around also.

.PIPELINE. PIPE

ANTARTICA STUDIES SCHEDULED BY CRREL LAB

Five members of the staff at the U.S. Army Cold Regions Research and Engineering Laboratory will be participating this winter in an International program for the study of glacial ice and marine organisms in Antarctica.

The CRREL team will be responsible for the drilling of three holes in the Ross Ice Shelf utilizing a wire-line mechanical drill developed at the Laboratory.

The first hole, which will go three-quarters of the way through the 1375-foot ice shelf, will be used to make age measurements of the ice. The ice will be melted at different levels and measurements made using radioactive techniques.

The second hole will be used to recover a 2-3/8-inch core which will be used in studies including determination of chemical constituents of the ice through a history that dates back into the pleistocene ice ages. CRREL recovered a 7,100-foot ice core from Byrd Station in Antarctica in 1968 and a 4,560-foot ice core from Camp Century, Greenland, in 1966. The ice coring project, sponsored in the U.S. by the National Science Foundation, has been a continuing one since that time.

WE HAVE DONE SO MUCH WITH SO LITTLE FOR SO LONG WE CAN DO ALMOST ANYTHING WITH NOTHING AT ALL

The third hole, 12-inches in diameter, will be used to study the sea water beneath the ice and to analyze the ocean bottom. An underwater television camera will be used to view the ice bottom and the sea floor.

In addition to the drilling, the team will make measurements of depth, temperature, inclination, and closure of the hole.

Nets, traps, and baited lines will be lowered through the hole in an attempt to sample life beneath the ice. In addition, the team will attempt to drill 90 feet into the sea floor which is 780 feet beneath the ice shelf bottom.

In addition to the United States, participating in the project will be scientists from Australia, Denmark, England, Japan, New Zealand, Norway, Soviet Union, Switzerland, and West Germany.

NEW WATER PURIFICATION UNIT TESTED BY MERADCOM

A mobile water purification unit designed to replace four existing water purification units is undergoing developmental tests by the US Army Mobility Equipment Research and Development Command (MERADCOM) at Ft. Belvoir, Va.

The 600 gallons per hour reverse osmosis water purification unit being tested is the first and smallest in a family of multipurpose units being developed for field support. When operational, the family will replace the ERDLator, the 150 gph distillation unit, the CW-BW decontamination kit, and the mobile ion exchange unit.

The reverse osmosis system is capable of producing potable water from polluted fresh water, sea water, and brackish water and in removing chemical and radiological contaminants from water. The system can even remove certain viruses and bacteria when aided with post chlorination.

"It should be highly effective, providing water of high quality wherever troops may be located," said Allen Ford a project engineer.

Reverse osmosis is the process of pressurizing raw water above its osmotic pressure, and forcing it through a thin cellulose acetate or polyamide membrane fabricated into a spiral wound element. Twenty elements are used in the new unit.

The development of a dry membrane represents an advancement in the state-of-the-art in reverse osmosis membrane technology. Unlike commercially available wet membranes, the dry membranes can be stored dry and are wet/dry reversible.

Incoming water is pretreated with calcium hypochlorite for

LINE. PIPELINE.

disinfection and a polymer to aid filtration prior to final passage through the RO elements.

The 600 gph reverse osmosis unit is mobile and can be air dropped to forward tactical units or towed on a trailer. In both cases, it will supply enough to support at least 2000 men per day.

ENGINEER DINNER AND CASTLE BALL DATES SET

Engineer officers should mark May 6 on their calendars as the date for the 110th Annual Engineer Dinner. As in past years, the dinner is planned to begin at 6:30 p.m., the Engineer Mess, Fort Belvoir, Virginia.

On hand will be Lieutenant General John W. Morris, chief of engineers, to present the Itschner Awards for 1976. In addition, elements of the U.S. Army Chorus and the Old Guard Fife and Drum Corps and Color Guard have been requested to entertain as they have at past dinners.

In conjunction with the dinner, the annual Castle Ball for officers, wives and guests will be held the following evening at the Engineer Mess. Theme of the ball will be "The Castle."

Ticket prices will be announced soon. For reservations and further information write: Protocol Office, Bldg. 216, Fort Belvoir, Virginia 22060 or call (703) 664-4300, (Autovon 354-4300).

Seating arrangement will be available for only 550 persons, so make your plans to attend now.

ITSCHNER AND STURGIS AWARD PREPARATION FOR CALENDAR YEAR 1976

Now is the time to start planning and preparing for the Itschner and Sturgis Award nominations. The Emerson C. Itschner Award is awarded by the Society of American Military Engineers (SAME) to the engineer company which best symbolizes the character, mission and performance of the Corps of Engineers. The award, presented annually at the Engineer Dinner at Ft. Belvoir, is named in honor of LTG Emerson C. Itschner, a former Chief of Engineers and past president of the society.

One of the aims of the award is to promote leadership in junior officers and to foster "espirit" in company sized engineer units. For the purpose of the competition, company sized units include all engineer numbered and lettered or headquarters companies, separate or belonging to a battalion, brigade, group or larger organization, and activated under a TOE/TDA. In the past, the award was limited to active duty units. In 1974, the competition was expanded, providing separate awards for both National Guard and Reserve units.

The Samuel D. Sturgis Award is awarded by the (SAME) to an active Army enlisted member in recognition of outstanding contributions to military engineering, by demonstrated technical and leadership ability. This award is also presented annually at the Engineer Dinner in honor of LTG Samuel D. Sturgis, A former Chief of Engineers.

For the purpose of the competition, the individual should be classified in one of the following career management fields or military occupational specialities while performing the service for which recommended: 12 Combat Engineering, 35E (Special Electrical Devices Repairman), 51 (General Engineering), 52 (Power Production), 62B (Engineer Equipment Repairman), and 81 (Topographic Engineering and Map Reproduction). The narrative description should emphasize the individuals contribution to military engineering. The term "military engineering" may be literally interpreted to include troop or contract construction, maintenance, facilities engineering, combat engineering, engineers training, management/supervision of engineers activities, or other engineer support.

Although the designation of a single winner from a field of highly qualified finalists is a difficult chore at best, the Itschner and Sturgis Award Selection Committee would like to see more units and enlisted members compete for these awards. The key to turning out a winner, in addition to having the qualifying credentials, is to adequately document the unit's activities and the enlisted members contributions over the course of a given calendar year.

The annual presentation of this coveted award provides a means of revitalizating the competition and renewing the challenge. How does your unit stand against the others? You can find out in 1977.

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COLONELS:

ASSIGNMENTS. The assignment picture remains the same. Each Engineer Colonel received a letter last October giving a more detailed analysis. Keep us advised of your "druthers."

OPMS COMMAND. Engineer Colonels will no longer be allowed to command both a troop unit and a district. The recently announced Combat Support Army Selection Board results were developed based on this policy. Specific assignments to command positions will be made by Colonels Division.

SPECIALTIES. The primary and alternate specialty designation has been entered in Section 1 of the Officer Record Brief [ORB] for each officer. Please check this information the next time you review your ORB.

LIEUTENANT COLONELS:

COMMAND. The LTC Combat Arms Troop Command Board will select officers best qualified to fill Engineer command designated position vacancies projected for 1 October 1977 through 30 September 1978. Centralized LTC Command Selection Boards will be convened after the calendar year.

ASSIGNMENT. Engineer 'O5's at CONUS installations can expect to stay in their current assignment for 36 months. Officers who complete 36 month CONUS assignments and are not overseas vulnerable will probably remain on station for one additional year. Exceptions to stability described herein will be made for officers selected to command battalions, those completing battalion command, and those having a specific skill required to fill a Department of the Army designated priority assignment.

MAJORS:

ASSIGNMENTS. With the continued reduction in PCS funds, Engineer Majors can expect to remain on station for a minimum of three years unless they are in a "must move" assignment [officers returning from Overseas tours, completing school terms, completing four years on the DA staff, completing three-year ROTC tours without volunteering for a fourth year, and completing two-year USAREC tours without volunteering for a third year]. This stabilization impacts on becoming qualified in your alternate specialty. Therefore, if you have not had an assignment in your alternate and there is an opening at your present duty station in that specialty, you should consider moving to that position. Call or write Major Woodham at MILPERCEN for advice and assistance.

PROMOTION. Everyone in the primary zone for LTC AUS or who will be considered for RA Major [YG 64] should insure that a current [and good] official photo is in their file. Also, update your ORB if you have not done so in the past year. Don't wait until the last week. [The Major, RA board is expected to convene 29 March and the LTC AUS board on 5 April].

OPMS. Many of you have wondered what the "mechanics" are in making an assignment now that we are no longer in a branch. In Majors Division, there are at least four officers involved. Data in the computer has each of you projected into either your primary or alternate specialty for your next assignment. Approximately 6 to 9 months prior to your date of availability [completion of normal tour] the specialty manager of the specialty to which you are projected will review your file, and slate you for an assignment based on the needs of the Army, your career development and your personal desires. [Our policy is to try and contact you by either telephone or mail prior to completing the slating]. After the specialty manager has firmed up what he feels is correct, your file is routed to your other specialty manager for concurrence. If there is a disagreement, they attempt to resolve it at that point. Your file then goes to the professional development officer for his concurrence. If he feels the assignment is not appropriate, he trys to resolve it with the two specialty managers. Your file then goes to the Chief of Assignments for final resolution.

The overriding factor on any assignment is the needs of the service. The next factor is professional development. For Engineers, it is extremely difficult to meet both due to the near critical shortage of Engineer Majors. A simulation model indicates that in order to meet the base minimum of Engineer requirements, Engineer Majors will be utilized approximately 80% of the time as Engineers. Therefore, you can see it will be extremely difficult to get you dual tracked in both of your specialties prior to promotion to LTC. Our goal, however, is to do so.

CAPTAINS:

Preference statements, letters, or verbal communication of an officer's preferences continue to be extremely important. Captains should insure that their assignment officer knows their desires at least one year, prior to DEROS or DTAV. All CONUS assignments are a minimum of 36 months in length unless the Army has an extremely urgent requirement that warrants breaking stability. Captains interested in ROTC assignments or civil schooling [graduate or undergraduate] during the next year should contact their assignment officer. If captains have any questions or concerns they should call their assignment officer. We will do what we can to help if it's within our power. Officers who have been in CONUS since 1970 are extremely vulnerable for overseas assignment [long or short].

LIEUTENANTS:

The selection board for CPT [AUS] convened in Nov 76 to consider first lieutenants of the Army and Women's Corps with a TDOR of 31 Jul 75 or earlier for temporary promotion to the grade of CP.

WARRANT OFFICERS:

Engineer Warrant Officers.

The following is a list of RA Engineer Warrant Officers as of 30 September 1976.

521A	11
621A	76
811A	3
821A	9
833A	2

AUS Promotions:

The next AUS CW2/3 and CW3/4 promotion board is scheduled to convene in January 1977.

FOR ALL:

Projected Requisitioning Authority.

The Army rarely is in a position where its officer assets, by specialty and grade, equal the sum total of all authorization documents. Like the commanders who are trying to do a job with fewer people than their TOE says they are supposed to have, the officer distribution planners and managers at MILPERCEN are also trying to make ends meet—but on a somewhat larger scale. The challenge is this—there are three principal factors which impact on the distribution process: assets, authorizations, and priorities. All three are in a constant state of change. Thus, there is a need for a master distribution plan which will assure that all commands, agencies, and activities receive, in line with their priority, a fair share of the available officer assets. The necessary management tool which brings the three principal factors into balance is called the Projected Requisitioning Authority—PRA for short—and as such becomes the Army's most important document for officer distribution planning. Properly used, the PRA is an equitable system which allocates officers to positions in accordance with established priorites and availability of the required personnel assets.

OFFICER RECORD BRIEF:

MILPERCEN has dubbed this the "YEAR OF DATA ACCURACY." Objective is for MILPERCEN and all others in the personnel business to make a special effort to improve the quality of our personnel records and, in particular, our automated personnel records.

Data quality is crucial to effective operations at MILPERCEN. Many key personnel decisions are made daily at MILPERCEN based on the records available. If records are inaccurate we run the risk of making an incorrect decision and adversely impacting on our officers' or soldiers' careers.

The Army is being pressed for more efficient management of all aspects of the personnel system. Having a quality data base is a key element for improved personnel operating both in the field and at HQA DA and MILPERCEN. Numerous top level personnel decisions pertaining to promotion allocations, assignment distribution, training requirements and others are largely dependent on statistical data and reports obtained from the automated personnel records.

The Officer Record Brief (ORB) has become a very, if not the most, important record MILPERCEN maintains on the Officer Corps. It is no more than a print out of the officer's record on the Officer Master File. ORBs are sent out through MILPOs to officers for review and audit. Careful audit and prompt return of ORBs must get priority attention. Considerable improvement is needed in this area.

CHANGE IN TIMES—PAY

As times change, so does a soldier's pay. For the most part pay has increased. Only twice; once before the Civil War, and once after, has military pay gone down. The QRMC has been around since the Civil War — only it wasn't called the QRMC. Below are the pay scales per month for a Corporal (E-4) and a First Sergeant (E-7 and E-8) from 1785 to present.

Corporal (E-4) Inf.	1785	1790	1798	1812	1854	1864	1871	1908
	$5	$4	$7	$6	$17	$20	$17	$24
	1918	1923	1942	1949	1958	1967	1975	
	$27	$44.10	$69.30	$124.95	$150	$251.70	$459.30	
First Sergeant (E-7 & E-8)		1833	1838	1854	1864	1871	1908	1918
		$15	$16	$20	$24	$21	$57	$57
		1923	1942	1949	1958	1967	1975	
		$96.60	$165.60	$249.90	$350	$537	$949.50	

These pay rates are averages for time in service. It should be noted that the actual grades have changed over the years, i.e., a First Sergeant was "Second Grade" a Corporal was a "Tech 5," etc.

IMPACT OF THE RIBBON BRIDGE

MAJ Peter J. Mackie

The introduction into service of the new Ribbon Bridge will solve many of the old problems of float bridge operations — but it will also pose some new ones. The aim of this article is to highlight these new problems and to suggest possible solutions.

Issue of the Ribbon Bridge system to units in USAREUR began in August 1976 with an appropriate amount of M4T6 equipment being phased out as the Ribbon Bridge is phased in. Introduction of the new equipment will prompt the formation of a new unit to operate it. The Float Bridge Company (Ribbon) will have the primary mission to haul, maintain and *install* the Ribbon Bridge. This mission is an expansion over that of the M4T6 equipped Float Bridge Companies which are organized to haul and maintain their equipment but not to install it.

Let us compare the installation of a 400 ft long M4T6 and Ribbon Bridge with a 60 ton capacity. The bridges are to be installed as part of a deliberate river crossing operation in the offense.

The first and obvious difference between the two is the bridge construction time — up to six hours for the M4T6 and one hour for the Ribbon. The faster Ribbon construction rate is a tremendous asset to the whole operation, but it will be a test for the Engineer Commanders. To emphasize this, let us assume that our bridge has to be open for traffic at H hour. The M4T6 commander would aim to be on site at H-6 hours and if he left a piece of equipment behind in the assembly area by mistake he could still send someone back to collect it and have the bridge open on time. The Ribbon commander, on the other hand, would aim to be on site at H-1 hours. If there is any flaw in his construction planning he will find it virtually impossible to complete the mission on time. The first lesson to be drawn from our example, therefore, is that the plan assumes a new importance in float bridge construction: accurate map reading, careful reconnaissance, strict road movement discipline en route to the construction site and command and control on the site must be close to perfect. To use a CPM analogy — the 'float' has disappeared out of float bridging.

A second factor relevant to the road move prior to construction is the respective times of the move vis a vis our H hour. The M4T6 convoy, for a final approach of one hour's duration, will be on the road from H-7 hours until H-6 hours. At this time the road net in the river crossing area should still be comparatively clear of non-engineer movement. The Ribbon convoy on the other hand will aim to move between H-2 and H-1 hour. During this period the combat units designated to cross the bridge at H hour will be forming up and moving into position near the bridge site. There is a real danger that our convoy of Ribbon Bridging equipment will become snarled with the tactical units and the whole operation will be delayed. With Ribbon Bridge, route priority is essential for the Engineers for movement to the river line.

Construction of M4T6 is relatively complicated and demands a high degree of skill within the constructing troop units. Hopefully, the prudent construction commander will have used his time in the assembly area to brief and rehearse his soldiers and to thoroughly check his equipment. In short, experienced Engineers know that there are pitfalls in M4T6 construction and plan accordingly.

Construction of Ribbon Bridge appears to be simple, as the bays are simply released from the transporter, slide into the water, unfold automatically and are coupled together. But is it really that simple? The honest answer is 'no' — the road latches and ponton latches still have to be released, drain plugs installed, winch cable released, shore lines tied and construction tools checked. None of this is difficult but failure to perform any one of the pre-launch steps will result in a hold up in the operation. The lesson to be learned — and hopefully not the hard way — is that although Ribbon *is* much simpler than M4T6, it still has to be handled with respect. Skill and professionalism are still essential to a successful build and, because of the potentially faster construction rate, even minor mistakes can threaten that success.

RIBBON BRIDG

Ribbon Bridge construction is dependent on the rate at which bays can be launched. With M4T6 bridging, the five ton Bridge Trucks do not normally back into the water. They can remain on firm level ground away from the waters edge. In a Ribbon Bridge build, the same trucks will usually have to back into the river. On a construction site with wide frontage and firm evenly graded access this will not pose a problem, but experience has shown that this situation is not the norm. The Ribbon Company will be issued with the flexible, fiberglass mat system known as MOMAT to aid truck access to the river. Similarly, the winches on the bridging trucks may have to be rigged to provide mutual assistance or, in extreme cases, entry slots may have to be cut. What is obvious, however, is that Ribbon Transporter drivers will have to be trained to overcome the access problem and that the various access improvement measures are going to have to be thoroughly tried, tested, and rehearsed. Finally, referring back to our bridging example, arrangements will have to be

made for the marshalling and dispersal of the 18 empty bridge transporters once the bridge is in place. They cannot be left on the bridge site but must be available for bridge retrieval when required.

Coupled with the truck access problem will be the problem of access to the completed bridge. The fact that a Class 60 bridge requires Class 60 approaches is often ignored in the rush to get bridge construction completed. In a 6 hour M4T6 build, the marking and upgrading of the immediate bridge access does not pose much of a problem. During the 6 hour construction time, dump trucks, bulldozers, improvised trackway, etc. could all be used, if required, to supplement the slow but well tried combat engineer methods of overcoming difficult ground. The one hour Ribbon construction time changes all this and the approach problem assumes a new importance on the critical path of crossing-site construction. That development personnel are aware of this, is evidenced by the new interest in rapidly emplaced trackway systems, night marking systems, etc. The fact that a Ribbon Company can install its own equipment does *not* mean that there is no longer a role for the Combat Engineer Line Company on a river crossing site. The construction and marking of approaches could well prove more difficult to accomplish than the construction of the bridge itself.

During an M4T6 bridge build there is usually ample time to concurrently install the anchorage system required. As Ribbon Bridge uses virtually the same anchorage systems — shore guys, kedge anchors and overhead cable — there is now a danger of our Ribbon Bridge being ready before the anchorage system. Without this anchorage, the bridge cannot be trafficked and the construction mission is not complete. To overcome this problem the Ribbon Company TO&E will include 14 Bridge Erection Boats mounted on modified Transporters which can be used, not only as a construction aid, but as a rapidly emplaced temporary anchorage system. The thrust from these boats can be used to hold the bridge in place until such time as the fixed anchorage system is complete and traffic is allowed to cross the bridge. This assumes that all bridge boats are functioning properly, emphasizing the importance of the bridge boat to the whole bridging operation.

Like the M4T6, the Ribbon Bridge can also be used to build rafts. A Class 60 Ribbon raft can be built in approximately 15 minutes provided that the transporters can get the bays into the water fast enough. Similarly, any upgrading and marking of approaches must be complete before the raft can operate. Although the whole 26 foot long End Ramp Bay articulates relative to the raft, shallow water will still pose a raft access problem as will the fact that the Bridge Erection Boat has a draught of 40 inches against the Ribbon rafts 20 inches. Accurate reconnaissance is just as important as ever.

In sumnmary, the introduction of the Ribbon Bridge is a big step forward in terms of our ability to cross water obstacles quickly. To use the equipment to its best advantage, we must know of its limitations and make adequate provision to overcome these. Although the basic equipment is much simpler to use than M4T6, it must still be treated with respect. The basic Combat Engineer skills of arriving on the right site at the right time with the right equipment and properly briefed soldiers are as important, if not more important, than ever.

Submitted by Major Peter J. Mackie, Royal Engineers, Senior Bridging Instructor, Field Engineering/Bridging Branch, Combat Operations Division, Department of Military Engineering, United States Army Engineer School.

Something is Very Wrong

LTC J. H. Moellering

It was a dark, chilly November night as Sergeant Hanford skillfully maneuvered his enclosed MP jeep around the curve of the gravel road. Suddenly, his headlights focused on an incredible sight. Two hundred meters ahead, the road simply disappeared! Braking sharply, he reached for his hand mike and ordered the Range Central operator to connect him with the Fort Campbell Provost Marshal at once.

"Sergeant Hanford, Sir. Something's very wrong! I'm on patrol in training Area 31. I just came upon a huge crater on Stampers Chapel Road. Looks to me like some artillery rounds have missed the South Impact Area."

Before he could continue, two menancing soldiers in field gear appeared on either side of his vehicle, rifles at the ready. After establishing that the Sergeant was not a part of the aggressor force, and convincing him to douse his headlights (*"The light line, Sergeant, is on the* east *end of the Reservation"*) the two soldiers explained that the crater had been deliberately placed earlier that day by Company C, 326th Engineer Battalion (Air Assault) as part of the barrier plan ordered by 3d Brigade, 101st Airborne Division. It was designed to stop enemy tanks (provided by the Kentucky National Guard) and had been created with "about 350 pounds of cratering charges."

"In fact, Ghost Corps Trail, Killebrew Road and Pleasant Mill Road have also been cratered and mined, so you won't be able to get through them either," the soldier was saying.

There had been misgivings about using real craters from the very outset. It's not really *safe* to use large quantities of demolitions outside a controlled demolition area. Blow them at *night?* Unheard of. Those are all *major* training roads on the Fort Campbell Reservation. You would close the reservation for weeks. Every unit in the Division would be operating on the reservation. You would inhibit the infantry and support units' ability to move, once on the ground.

These objectives had all been discussed with the Division Commander in the early planning stages of "Exercise Orbiting Eagle V" — a maneuver which would pit one Brigade of the 101st using Air Assault tactics against an enemy brigade-sized force augmented with National Guard tanks and APCs employing Soviet bloc tactics. Having listened to the arguments on both sides of the issue, the Division Commander announced, "We will use actual craters and live demolitions on all major roads of the reservation except those which are asphalt." And, turning to his engineer battalion commander, he added with a half grin, "Naturally I hold you personally responsible to repair all those roads after the exercise."

A shortcoming of some infantry brigade S-3's is their lack of expertise in properly employing all members of the combat arms team available to them. The S-3 of the 101st's 3rd Brigade, was different. The Commander of Company C, 326th Engineer Battalion was standing before the operation's map in the 3rd Brigade TOC explaining to the 3rd Brigade Commander and the Bde S-3 the details of his proposed brigade barrier plan. Having received the "green light" from the Division Commander on the use of live craters, the Brigade Commander realized what a powerful tool he had for influencing the action, particularly since off-road mobility for tanks at Fort Campbell is relatively limited. The Crater locations were carefully selected for maximum impact and were augmented with minefields, tied in to natural obstacles, and covered by fire.

Several craters were actually blown, three at night. The effect on enemy armor and mechanized forces was devastating. The Chief Controller declared that all tanks had been destroyed in the attack, many of them more than once.

Achievement of true realism in training requires paying a price. Certainly, we must do our best to limit maneuver damage; certainly we must repair the damage we do. But "doing damage" to fixed facilities is a prime combat mission of the combat engineers. And unless they are afforded the opportunity to "do their own thing" in a combined arms maneuver setting, the other elements of the combined arms team will never gain a true appreciation for the kinds of capabilities and assistance afforded by combat engineers. In essence, these "live fire" tactical exercises will do a great deal toward fixing in the mind of the infantryman and tanker how he can enhance his already considerable capability. To achieve this requires a philosophical attitude on the part of the installation commander that the military reservation is his to "consume" much as one consumes ammunition from a CTA in training infantry. Recognizing this, the divisional engineer battalion has placed maximum emphasis on constructing hasty structures — bridges, towers, bunkers, culverts, etc. — of natural timber. The Division Commander has strongly backed this practice. There is, at the same time a vigorous reforestation program underway by the Fort Campbell Facilities Engineer to insure that trees are available in the future. During non-tactical periods, the full capability of the engineer battalion can be used to repair the craters and maintain the roads. The outstanding results achieved at Fort Campbell indicate that the benefits clearly outweighed the costs.

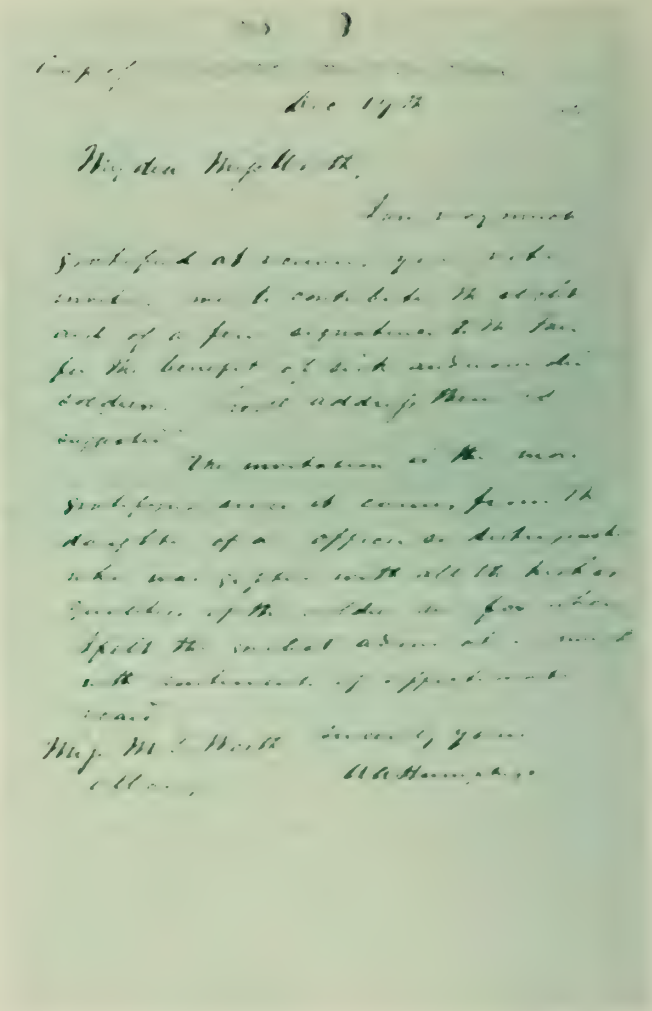
AUTOGRAPH COLLECTING

CPT John J. Connor

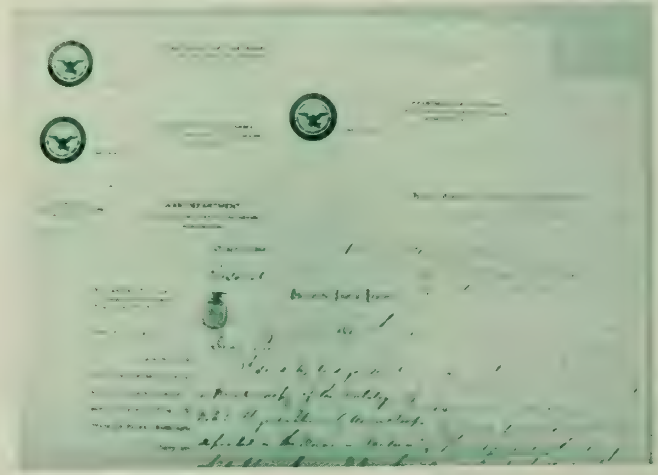
Autograph collecting is a "topical" hobby. Some of the common subjects collected are United States Presidents, Members of the Continental Congress and Civil War generals. Some of the less common subjects include Nobel Prize winners, Medal of Honor recipients and British royalty. In recent years, two new topics have become popular, astronauts and principals in the Watergate scandal!

Often the topic has a relationship with the collector: a doctor may collect autographs of famous figures from the medical sciences, or someone from Texas might seek autographs of famous Texans. In this fashion, an appropriate collection for an officer in the Army Corps of Engineers would be correspondence of the forty-five men who have held the position of Army Chief of Engineers. Such a collection spans more than 180 years, as the first Chief died in 1796. It also overlaps with several other topics including Civil War generals and Medal of Honor recipients.

When thumbing through catalogs it takes a keen eye to spot a Chief Engineer as you'll seldom, if ever, find him listed as such. General Rufus Putnam, the second Chief, serving from August to December 1776, would probably be listed as "Ohio pioneer." As he is best known for leading a group of Revolutionary War veterans to found what is now Marietta, Ohio. He also served as a judge of the Supreme Court of Ohio and as Surveyor General of the United States. Similarly, Major General Horatio G. Wright, Chief of Engineers from June 1879 to March 1884, is usually referred to as "Commander of Union VI Corps."

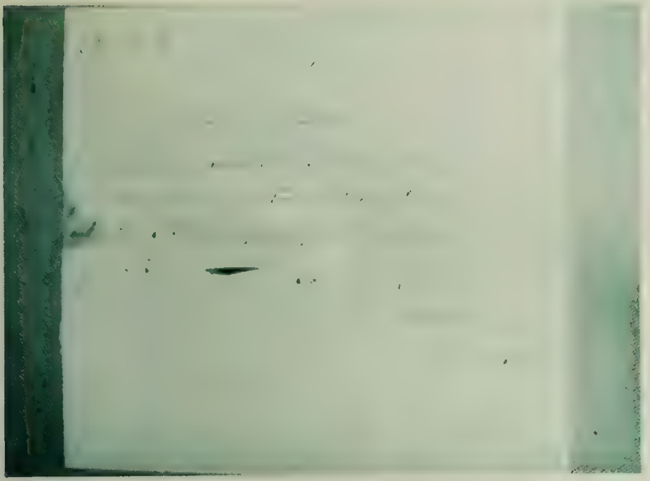


Autograph letter signed by Major General A. A. Humphreys while Chief of Staff of teh Army of the Potomac. Humphreys was the Army's fifteenth Chief of Engineers, serving from August 1866 to June 1879.



Letterheads of the Office of the Chief of Engineers between 1867 and 1976.

This topic also presents a problem to those who like to collect autographs of "incumbents," that is, a document signed during the period the person held the job. Brigadier General Henry M. Robert's tenure was a scant two days; appointed on April 30, 1901, he retired on May 2, 1901. His successor, Brigadier General John W. Barlow, topped this record by retiring one day later on May 3rd. By contrast, Major General Joseph G. Totten served in the position, from December 1838 to April 1864. Incidentally, General Robert is the author of the



Letter written by a clerk, signed by Colonel Rufus Putnam, Chief Engineer of the Continental Army from August to December 1776. This letter was written to a state governor, probably prior to 1790.

"Pocket Manual of Rules of Order," the famous book of parliamentary law commonly known as "Robert's Rules of Order."

One additional feature of this topic is that it gives rise to a logical sub-topic, namely, Office of the Chief of Engineers letterheads of which there are more than a dozen different examples in the last hundred years. Part of the joy of a topical or specialized collection is the opportunity it presents to study the lives of the persons whose autographs are being sought, and to come to know them as real people and not just scraps of paper. The Chief Engineers were real people; let's take a look at a few.

One of the most fascinating of the forty-five Chief Engineers was the very first, Colonel Richard Gridley (June 1775 to August 1776). At age 65 he forsook a pension and other rewards for service in the British Army to join the Revolution. It was Gridley who laid out the defensive positions for the Battle of Bunker Hill and for the Seige of Boston which led to the British evacuation on March 17, 1776.

The third and fourth Chiefs were Frenchmen, apparently recruited by Benjamin Franklin. Interestingly, both men — Major General Louis Duportail and Lieutenant Colonel Stephen Rochefontaine — returned to France to fight *for* the King during the French Revolution, and both men escaped back to America after the defeat of the monarchy. Jonathan Williams, grand nephew and secretary to Benjamin Franklin became the Army's sixth Chief Engineer (April 1802 to July 1812) as well as the first Superintendent of West Point. Williams was not the only Chief with a famous relative. General Walker Armistead was the Father of Confederate General Lewis A. Armistead, killed leading Pickett's charge at Gettsburg. General A. A. Humphreys' grandfather designed the frigate USS CONSTITUTION (Old Ironsides). General James Duane's grandfather was a member of the Continental Congress and the first major of New York. Finally, General William Marshall was a direct descendant of Chief Justice John Marshall.

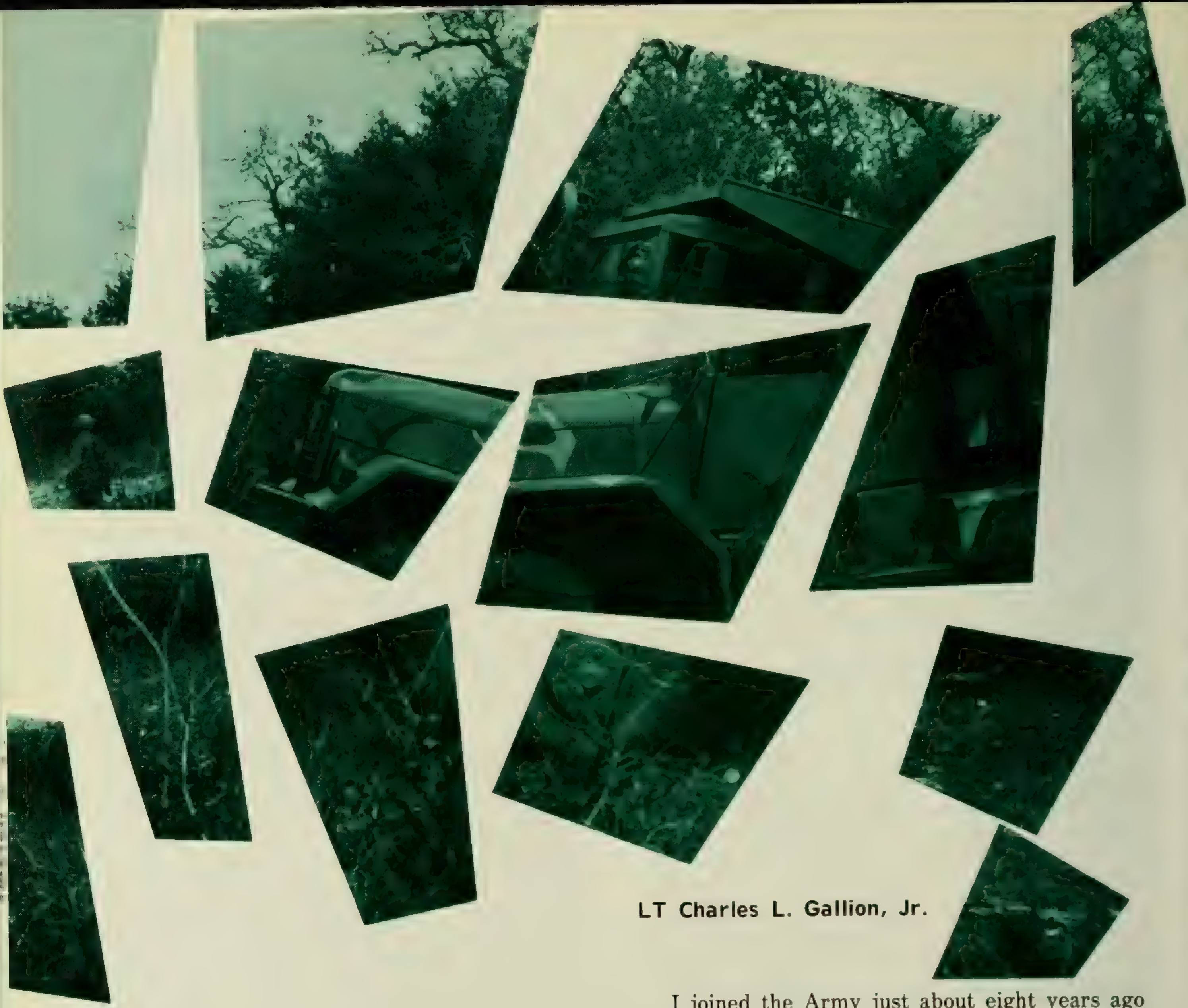
As stated previously, many of the Chief Engineers earned distinction during the Civil War, either as commanders or as engineers. Four were Southerners who supported the Union: John Newton and William Craighill of Virginia; Henry Robert of South Carolina; and George Gillespie of Tennessee recipient of the Medal of Honor for gallantry at Cold Harbor. Brigadier General John M. Wilson also received the Medal of Honor for action at Malvern Hill. Because of the wide interest in this period, autographs of the Chief Engineers of this era are more readily available than any other period excluding the last thirty years.

Above all else, whatever their other accomplishments, the forth-five Chief Engineers were practicing engubeers and not merely administrators. Here are four examples of their work: Brigadier General Joseph Swift (1812-1818) directed the rebuilding of the Capitol after it was burned during the War of 1812. Brigadier General Thomas Casey (1888-1895) completed the Washington Monument, which, already 173 feet high and leaning badly, had to be straightened and provided with a new, solid foundation. Major General William Black (1916-1919) chaired a board of engineers tasked to raise the sunken battleship MAINE from Havana harbor and Lieutenant General Raymond A. Wheeler (1945-1919) personally directed the massive salvage operation in the Suez Canal after the 1956 Middle East War.

Such a specialized collection obviously means slow — but satisfying — progress. Above all it has developed a greater appreciation for the important role the Corps of Engineers has played in shaping the history of the United States.

By the way, if you have any letters of William Trent Rossell, the 28th Chief of Engineers, hidden away in a drawer . . .

A 1972 EOAC Graduate, Captain Conner is presently serving as the S-2 and Information Officer for the 39th Engineer Battalion, (Combat), Fort Devens, Massachusetts. He has also received his BS in Geology from Boston College.



Keeping it Together

LT Charles L. Gallion, Jr.

I joined the Army just about eight years ago and in many ways I'm just like many of the younger soldiers I've seen over the years. Used by the Army on every imaginable detail, taken far away from home to a strange country, and never once have I gotten a promotion. By now I should have been recognized or something; but I've never been recommended. It's a sad story; but true. Not even an Article 15 in my logbook, although I've appeared on the deadline report a couple of times. You see, I'm not the "ordinary" American Soldier. I'm A-88, multi-fuel powered, and owned by Uncle Sam. Some may call me a Dump Truck, others a Five Ton; but by the book it's really Truck, Dump, 5 Ton M51A2. Anything you ever wanted to know about me is printed in my biography. TM 8-2320-211-10. Sequels have been written that go into greater detail, these are the -20 and -34. Not as famous as TOLKEIN'S TRILOGY and they'll probably never make it to the movies; but it is a good reading collection. You really should read them for my sake.

I've sat back and watched things take their natural course for a long time, and now it's time for me to speak up and take care of myself before it's too late. Hundreds of others like me feel the same way and I've been chosen as the spokesman for all military vehicles. We're tired of being driven and neglected to death and even worse, transported to the Property Disposal Officer (PDO). My time is short, maybe two years at the most, and then my logbook will reflect "DEATH BY UNNATURAL CAUSES" like so many of my friends. My transmission seals are leaking, pistons worn, and my new operator insists on reving me past the maximum permissible RPM. That kind of treatment can mean only one thing for us — a blown engine. Sure, you can say "we can replace an engine;" but I'm eight years old with 82,000 miles, far past the limits of being economically repairable. Why not replace an operator it's cheaper, or better yet, train him to be a better operator. Keep one man on me until he knows the whole works inside and out. Daily checks in the morning are a good start; but make sure he follows up later with those during and after operations checks. Remember he needs my biography to do it right. Once the program is under way you'll be surprised how fast it catches on, and how much better we respond. I'm here to serve you and without proper care, I'll quit when you need me the most.

Over longer periods of time the Equipment Serviceability Criteria (ESC) is a good indicator of my COMBAT READINESS. It's good up to 90 days and gives a RED-AMBER-GREEN rating in all of my functional areas. I'm AMBER right now on three counts for engine, transmission, and rear differential mileage 'cause I have over 50,000 miles; but I'm ready if the need arises. Without an operator's care, I'll turn out to be a headache for everyone concerned, and end up as a Not Operational Ready (NOR) listing on the 2406. I might even add to your RED percentage and throw your Readiness Conditon (REDCON) out of whack. It's a nasty business; but I have to tell it like it it.

Now I'm speaking to a much higher level than the operator, right? It's sort of like the Big Picture and the root of a good Maintenance Program. Everyone from top to bottom has to get involved. Occasionally, I've witnessed supervisors give the OK to operate a vehicle in less than satisfactory condition. No mission can be that important and that's why we break down. Call it a revolt or a mutiny; but we like to think of it as a "Trucker's Strike." This is our time to stand up for our rights. A well timed strike forces you to re-evaluate and correct our deficiencies. At this point, we get the attention of everyone and are finally in the spotlight. Prescribed Load List (PLL) Clerks order parts, The Army Material Management System (TAMMS) Clerks make out the necessary reports, Maintenance Warrant Officers diagnose the problem and mechanics prepare to replace components. Supervisors and platoon leaders look for a replacement to finish the job that I couldn't and the Company Commander is busy explaining to the Battalion Commander. Wouldn't it be easier on everyone to plan their maintenance periods rather than let me do the scheduling. When I make the decision, I'm not as considerate of your mission requirements. It's far simpler to do something right the first time, every time, than to waste time correcting a larger problem magnified by the course of time.

A-88 isn't my only name. I could be any one of the vehicles looking back at you from the motor pool. I may even be your truck, so if my story sounds a little familiar, maybe you should check out your maintenance program.

LAKE MENDICINO

CPT Robert L. Harder

The historic versatility and *"Can Do"* performance of the Corps of Engineers was demonstrated at the Lake Mendocino Recreation Area in Ukiah, California, 120 miles north of San Francisco. In July 1975, the Corps' San Francisco District was granted $754,000 through the Department of Commerce under the provisions of the Emergency Jobs and Unemployment Assistance Act of 1974 (Public Law 93-567; *"to provide emergency financial assistance to stimulate, maintain or expand job creating activities in areas, both urban and rural, which are suffering from unusually high levels of employment."* The San Francisco District was to hire unemployed persons from Mendocino County, primarily for recreation resource improvement. As a result of this unusual program, the District was placed in the unique situation of filling all three principal positions of a major construction project: User, Designer, and Builder. The formation of a Construction Management (CM) team to coordinate the program was a logical and natural result. With characteristic *"Will Do"* determination, personnel from the District's Operation (User), Engineering (Designer), and Construction (Builder) sections quickly organized to insure the successful implementation of the Lake Mendocino program (the largest of 25 such programs assigned to the Corps).

Hiring Restrictions

Particularly challenging was the requirement to meet the many restrictions and goals specifically outlined in the Title X legislation. One such goal was the requirement to hire the majority of the work force within two weeks of being notified about the program. An analysis of the work to be accomplished and a survey of the unemployed work force in the local area demanded the development of a simple, yet flexible organizational structure. Accordingly, ten 6-man crews were proposed, each comprised of five laborers and one leader. It was anticipated that such a *'squad-type'* organization would enable crews to be easily combined or interchanged with minimum difficulty. (As the program progressed, the appropriateness of such an organization was repeatedly demonstrated as inclement weather and material delivery delays often required changing work schedules on short notice.) For supervision and support, six office positions were also proposed, including toolkeepers, clerks, and a safety officer. With a minimum of job descriptions involved, the task of identifying qualified applicants through the state employment officers was expedited. Although the precise, stringent eligibility criteria required by the program (based upon an applicant's unemployment history) posed an additional restriction to the hiring procedure, the timely coordination of effort between the project, District, and state employment personnel enabled a work force of 66 men and women to be employed and busy at work by the end of July. (During the course of the program, the multi-disciplined work force increased to a peak of 80 persons, including unemployed archaeologists and social scientists.)

Adequate Supervision

Another work-related restriction of the program that was of considerable concern was the problem of providing adequate supervision of the work force. Since program funds could not be used for salaries of permanent Corps personnel at the project or District level, it was imperative that the work crews assume a large part of the responsibility for their own performance. To facilitate the identification of workers with leadership ability, it was proposed that assistant foremen and assistant crew leader positions be created and filled by promoting qualified members of the work crews. Motivated by the possibility of promotion, many workers quickly developed and demonstrated excellent supervisory capabilities, enabling the program to become largely self-managing as anticipated. In addition, as many of the crew leaders resigned during the course of the program to accept permanent employment elsewhere, the promise of such upward mobility proved to be a continuing incentive to the work force.

Material Limitations

Perhaps the most challenging aspect of the program was the requirement to meet the severe restriction imposed upon material purchases: a maximum of twenty-five percent of the allocated funds could be expended for supplies and materials required in support of the program. In these times of spiraling material costs, the development of constructive, meaningful work projects within such a strict material budget required through deliberation. A study of the various stages of development of the camping and day use areas as outlined in the project's Master Plan resulted in a listing of proposed projects that promised compliance with the strict labor/material ratio of 75/25. By balancing labor-intensive projects with those requiring considerable material purchase, an overall labor/material goal of 80/20 was established. Detailed records were updated weekly reflecting the total manpower and material expenditures for each work project. These records

were then used to determine each individual project's labor/material ratio. Continuous monitoring of these ratios and the careful reallocation of available men, and machinery resulted in a balanced project mix that kept the overall material costs well below twenty percent. In addition, such detailed cost records proved to be a valuable source of historical data for estimating work project of a similar nature at other project locations.

As a result of the coordination and preplanning accomplished by the CM team, and through the continuous reallocation and balancing of program resources, a diverse combination of work projects was successfully completed, that greatly enhanced the long-term protection and use of the environment and natural resources of the area. Most of these projects were aimed at the staged improvement of Lake Mendocino's many recreation facilities i.e., the construction of individual and group picnic shelters, group barbeques and picnic table pads in day use areas; the lengthening of selected campsites to accommodate longer mobile camping units; the design, fabrication and erection of natural-material play structures for the younger park visitors; the development of a 5000-meter nature trail system selectively marked with distance and interpretive signs; the construction of a central ranger station to facilitate traffic control in adjoining day use and camping areas; the upgrading and rehabilitation of many access and circulation roads in the project area; the development of

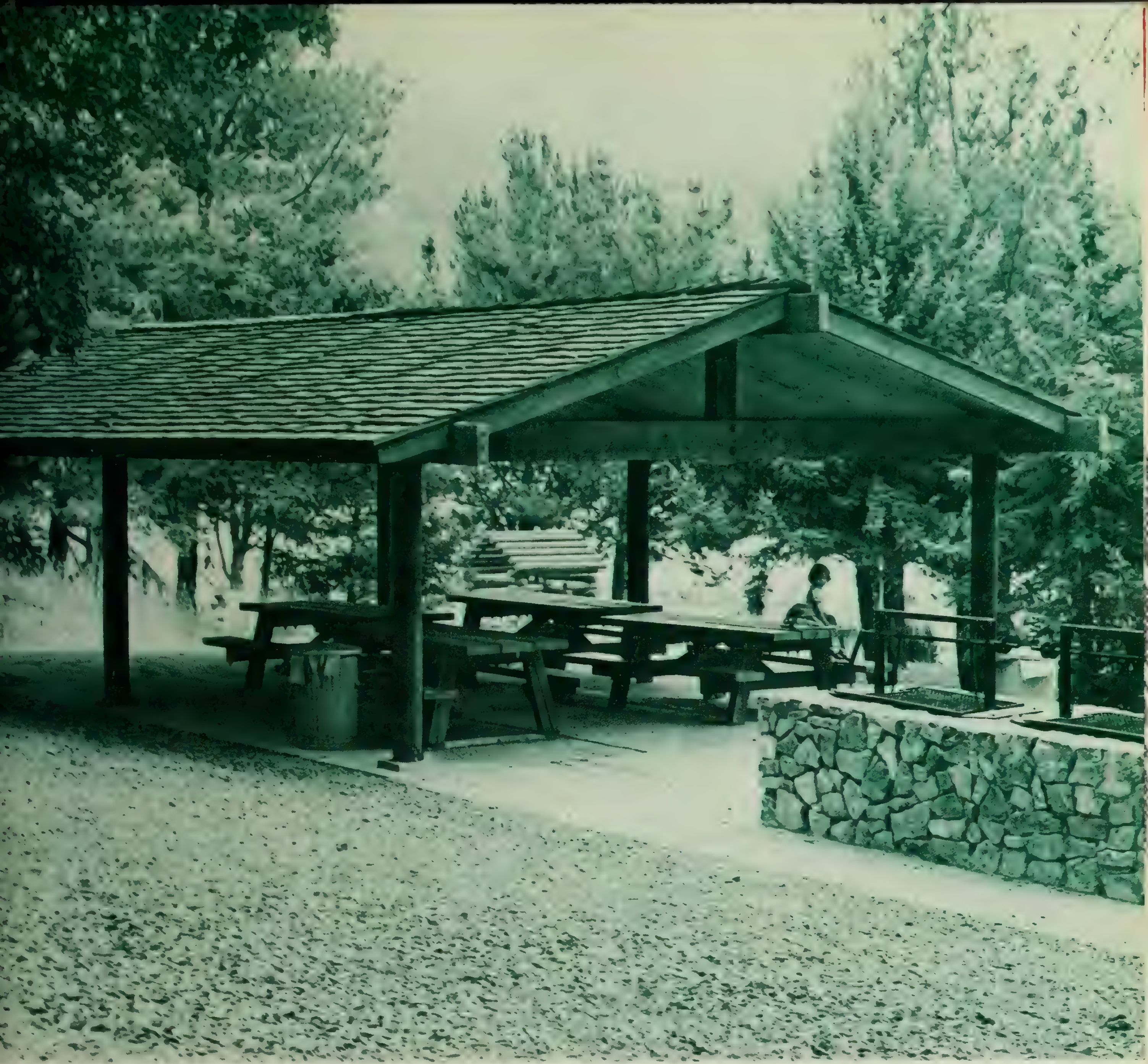
a natural amphitheater for evening slide/movie presentations and interpretive programs; and the refinement of an extensive footpath and footbridge system for park pedestrians to improve circulation between all facilities.

In addition to these facility-oriented projects, considerable manpower was directed toward the protection and preservation of the area's natural resources. These projects included the development of numerous fish habitat shelters around the lake; the placement of over 3000 tons of select riprap for shore protection; the construction of traffic barriers and guardrails for landscape protection; slope planting and drainage-works improvement for erosion control; and landscape planting for general area enhancement. Additionally, an extensive Cultural Resource Study was conducted to research and record information concerning the archaeological and ethnographical history of the Coyote Valley area. These many and varied projects richly enhanced the operation. maintenance, safety, and beauty of the entire project area and have greatly improved the utilization and enjoyment of park facilities by all visitors.

Productive Job Training

When the $754,000 Title X — Job Opportunities Program at Lake Mendocino ended in June

1976, over $600,000 had been paid in direct salaries to over 100 previously unemployed Mendocino County residents. Additionally, over $100,000 of supplies and materials were purchased from local area vendors, significantly contributing to the economy of the community. Even more significant than the one-time cost of the program, however, was the long-term investment in manpower achieved at Lake Mendocino. With a number of craft skills available in the predominantly unskilled or semiskilled work force, an informal apprentice training program naturally developed. By rotating work crews through the varied mix of projects, each worker became familiar with the basic techniques of carpentry, masonry, concrete placement and finishing, roofing, painting, plumbing, equipment operation and maintenance, and environmental protection measures, including erosion control and selective landscaping. This basic orientation completed, some work crews were reorganized, matching worker interest and aptitude with the more complex projects scheduled in each craft field. The resulting increase in worker motivation and skill level was clearly evident in the well-crafted facilities, a lasting testimony to the success of the program. In addition to such acquisition of craft skills, considerable emphasis was placed on the development of good work habits and attitudes, safety and environmental awareness, and team-



work, including active participation in work planning, scheduling, and personnel supervision. The habits and skills thus obtained by the workers enabled many of them to obtain permanent employment upon completion of the program.

Conclusion

Meaningful employment — Valuable training — Tangible results. The Lake Mendocino Title X Program was indeed Job Opportunities at its best. The success of the program exemplifies the flexibility and professionalism demanded of the Corps in response to its many missions. Be it flood control, disaster assistance, or help for the nation's unemployed, the spirit of the Corps of Engineers rings clear: "Essayons: Let Us Try!".

CPT Robert L. Harder is the Special Assistant to the Chief, Construction-Operations Division, San Francisco District, Corps of Engineers. Since joining the District in July 1975, he has been Project Manager for the Title X — Job Opportunities Programs in Mendocino, Sonoma, and Del Norte Counties. CPT Harder is an alumnus of the University of Colorado where he earned a B.S. degree in Architectural Engineering. He is also a graduate of Oregon State University where he completed two M.S. degrees in Construction Engineering Management and in Soil Mechanics and Foundations. CPT Harder is a registered professional engineer in Oregon.

MAJ Matthew J. Jones

200 YEARS OF MILITARY ENGINEERING

PART 2

With the war now accomplished fact, military engineers girded their loins for still another kind of conflict — attacking the rampaging waters of our central river system. In 1927 the Mississippi and Ohio rivers overcame their banks from Illinois and Kentucky to the Gulf of Mexico. The tragic loss of human life and demolition of property throughout the region caused Congress to summon military engineers to embark on a program for controlling floods. Military engineers undertook a continuing series of projects for the control of floods and related programs concerned with navigation, electric power and irrigation.

Navigation routes along the Illinois River waterway between Lake Michigan and the Mississippi River were completed. A navigation system on the Mississippi from the mouth of the Ohio to Minneapolis-St. Paul was developed. A chain of canals to link the 1,200 mile Atlantic Intercoastal Waterway was brought to completion. Dams like the Fort Peck on the Missouri River and the Bonneville on the Columbia were built. These and other dams provided flood control systems, helped regulate water navigation, supplied water, produced huge quantities of hydroelectric power and furnished year-round recreational areas. Military engineers concentrated much of the 20's and 30's on water resource preservation, improving waterborne transportation capabilities and serving the needs of the people.

The experience gained in civil works would soon pay huge dividends in a defense emergency. On 1 September 1939 Hitler's armies introduced Blitzkrieg to the world, by overrunning Poland. The biblical Armageddon was to be visited not on the plains of Meggido but on the rolling countryside of Europe and in the islands of the calm ocean.

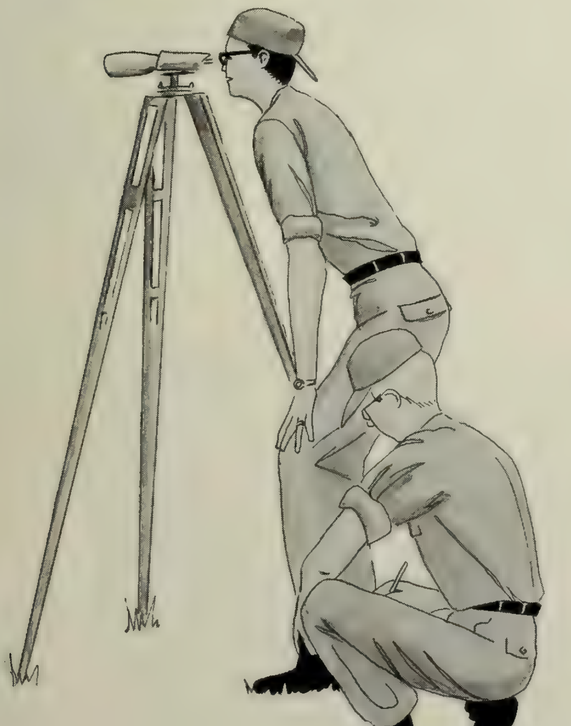
Pacifism and isolation were the order of day throughout the 30's infecting even many top levels of the War Department. In spite of Protective Mobilization Plans drawn so as not to repeat the unpreparedness experienced in 1917, no one realized the magnitude of the effort which would be needed to stem the Axis legions. The nation was beginning to re-arm by 1939 — to prepare for it really knew not what. Again military engineers were gathered in recognition that construction would be the controlling factor in mobilization. Technology had again changed the character of warfare and the preparations therefor. Mobilization camps, arsenals, depots, hospitals, seacoast defenses and training schools were needed; so were airfields, aircraft factories, ships, shipyards and a host of supporting facilities.

Before the war ended military engineers had been responsible for the acquisition of 38 million acres of real estate and the completion of approximately 3,000 command installations and 300 major industrial projects. Included in this were 500 camps, 765 airfields, 167 depots and numerous other facilities. The Pentagon was one of these projects. To accommodate the major activities of the Army in one headquarters this five story, reinforced concrete structure on concrete pile foundations was planned, designed and built in 16 months at a cost of $65 million. Several hundred architects and engineers and up to 15 thousand construction men at one time labored day and night to complete this impressive structure in so short a time.

In spite of all the mobilization effort, war surprised us on the infamous day of 7 December 1941. The nation was not yet fully ready. The pace of activity hastened toward a four million man force. At its peak in 1942 construction to support this force was being placed at the rate of over $20 million per day.

In the theaters of operations, military engineers fought and constructed. In the Pacific they built ports, airfields, and huge bases in dense jungle and on coral reefs. On the Asian mainland they built the Burma and Ledo Roads across impassable terrain. North Africa and Europe also witnessed the ability of the American military engineer. Military engineers landed as much as one hour in advance of the first assault waves of infantry and armor on Omaha and Utah beaches. They helped clear the way through the mine fields and hedgerows of Brittany. Across France they cleared rubble-choked roads of war torn cities and reduced natural obstacles. They defeated the raging rivers and the difficult mountains of Italy, France and Germany with bridges and rafts. They kept the famous Luddendorf railroad bridge at Remagen open long enough for the Allies to gain a toehold across the Rhine. They pushed pipeline, road, and railroad construction to bring forward the supplies needed to sustain the advance.

To protect our nation's northern flank a line of communication was needed to tie Alaska to the Continental United States. Military engineers undertook a road construction engineering feat of titanic proportions. Despite weather, terrain, and often criticism the Alcan Highway reaching 1,523 miles from Duncan Creek, British Columbia, through the Yukon Territory to Fairbanks, Alaska was completed in just a year.



World War II was a multi-faceted war. LTG Reybold, Chief of Engineers during the war, called it an "Engineer War" by virtue of the unprecedented engineering requirements needed to support air power, amphibious assault, and armored mobility. He observed that the military engineer was involved in every tactical and logistical decision because it was he who made possible the commander's most daring plans. And, he concluded that "By war's end it was evident that American engineering capacity was the one factor of our strength which our enemies most consistently under estimated."

The atomic bomb marked the finish to World War II. Military engineers were much present in the top secret Manhattan Project that developed the weapon which carried us into the atomic age. V-J day quickly followed the detonation of the first atomic bombs over Hiroshima and Nagasaki. The war was over and military engineers in the face of a cold war returned to peaceful pursuits.

Increasing emphasis on water resources management and modernization of the Ohio, Arkansas and Missouri Rivers occupied the military engineer until June 1950 when their attention was directed to Korea where the Cold War had suddenly gotten hot. The unexpectedness of the violation required many military engineers to engage in combat initially as infantry. Coupled with this role the rugged, mountainous terrain which dominates Korea engendered no end to the number of problems to be overcome. Moving troops into position and keeping them supplied called for uncommon effort. Aerial tramways solved this problem; but, in the Korean valleys — the only real maneuver area — military engineers had other problems in terms of obstacles and the flooding that caused these flat areas to become a nightmare. Bridge building became a daily occupation for the military engineer.

The Korean conflict ended in a truce but the hot and cold war of the 50's brought a new dimension to our security needs. Military engineers helped to construct warning systems like Dewline which spans the North American frontier. They also undertook major missile construction efforts in the NIKE, ATLAS, TITAN and MINUTEMAN launching and support facilities, and expanded our air bases to accommodate the heavier jet aircraft used to support Strategic Air Command operations.

Military engineers also travelled to Greenland to construct Camp Century, the city under the ice. Their objective — to study the polar regions with a view toward opening it for human usefulness and habitation. The 50's included other major projects for the military engineer. The long planned Saint Lawrence Seaway Project, which opened the Great Lakes ports to seagoing vessels, became a reality theough their efforts.

The 60's fulfilled the military engineer's long term role as pioneer, explorer, scientist, builder. For now he reached out to man's infinite frontier — outer space. Military engineers helped to plan and build our space age staging center at Cape Canaveral and continue to engage in the engineering of ground support facilities for space vehicles as well as in the planning for extra-terrestrial construction.

The 60's also brought the nation to a highly controversial role in supporting our commitment to the defense of Southeast Asia. Ignoring the controversy over the national effort there, and concentrating on the performance of the military engineer in his role, one can but observe that he did his job well. His first major task was the construction of air bases, seaports and logistical installations to support the arrival of increasing numbers of combat units. The terrain of Southeast Asia made the conventional tactics and machines of modern war unsuitable for much of the area. The air mobile operation came into its own as a key tactic with the helicopter joining the ranks as the workhorse to support the Army in the field.

Military engineers constructed hundreds of air strips and heliports with supporting fuel and maintenance facilities. They developed air mobile engineer equipment that could be lifted into remote worksites. Without a conventional front line the conflict was fought everywhere. They built base camps and fire bases throughout the country and then tied them together with land lines of communication, an enormous road network complete with bridges. They thwarted the enemy's ambush tactics by clearing large areas of land along these routes using large numbers of tractors with special land clearing or "Rome Plow" blades. And they devoted significant measure of their time to civic action projects of direct benefit to the civilian population.

The cessation of American participation in the Vietnamese conflict has turned military engineer attention again to peaceful purposes. Thus, the military engineer pursues his dual role of builder and preserver of our nation — always doing both — emphasizing the one or the other as national policy dictates — but ever ready to redirect his efforts when his nation asks it of him. Whether dredging a harbor at one of the port cities on our three coastlines; building a dam in the western reaches of the nation; mapping uncharted regions of the hemispheres; upgrading facilities at our military installations; teaching in the academic halls of our service schools; participating in NATO exercises; undertaking research in our laboratories; or developing new equipment and materials and systems to do his job better and more efficiently, the military engineer's principal focus is national preparedness — prepared, in peace, to enhance the quality of life of the American people; and, in war, to defend it.

Two hundred years of military engineering — indeed, a strong, enduring and glorious foundation for the future. It is to us now to duplicate that same superb quality in the structure to be placed on that foundation.

Major Matthew J. Jones, Jr. is assigned to the Office of the Deputy Chief of Staff for Operations, HQDA. A civil engineering graduate of the University of Detroit, he was commissioned in the Corps of Engineers in 1962. Since then he has served with the 326th Airborne Engineer Battalion; the 8th Engineer Battalion, 1st Cavalry Division; the 2d Engineer Battalion, 2d Infantry Divison; the US Army Support Command-Vietnam; MACV; Test Command, Defense Nuclear Agency; and the US Army Engineer School. Major Jones has a Masters Degree in civil engineering from Stanford University and is a graduate of both the Engineer Officer Advanced Course and the Command and General Staff College.

WHISTLE WHILE YOU WORK

So you've been crying about how much work you're doing. Never get any time off, eh? Well, let's look at it this way. There are 365 days in a year. You are entitled to 30 days leave and have the privilege of a three-day pass about every six weeks. That's a total of 56 days, leaving 309 days.

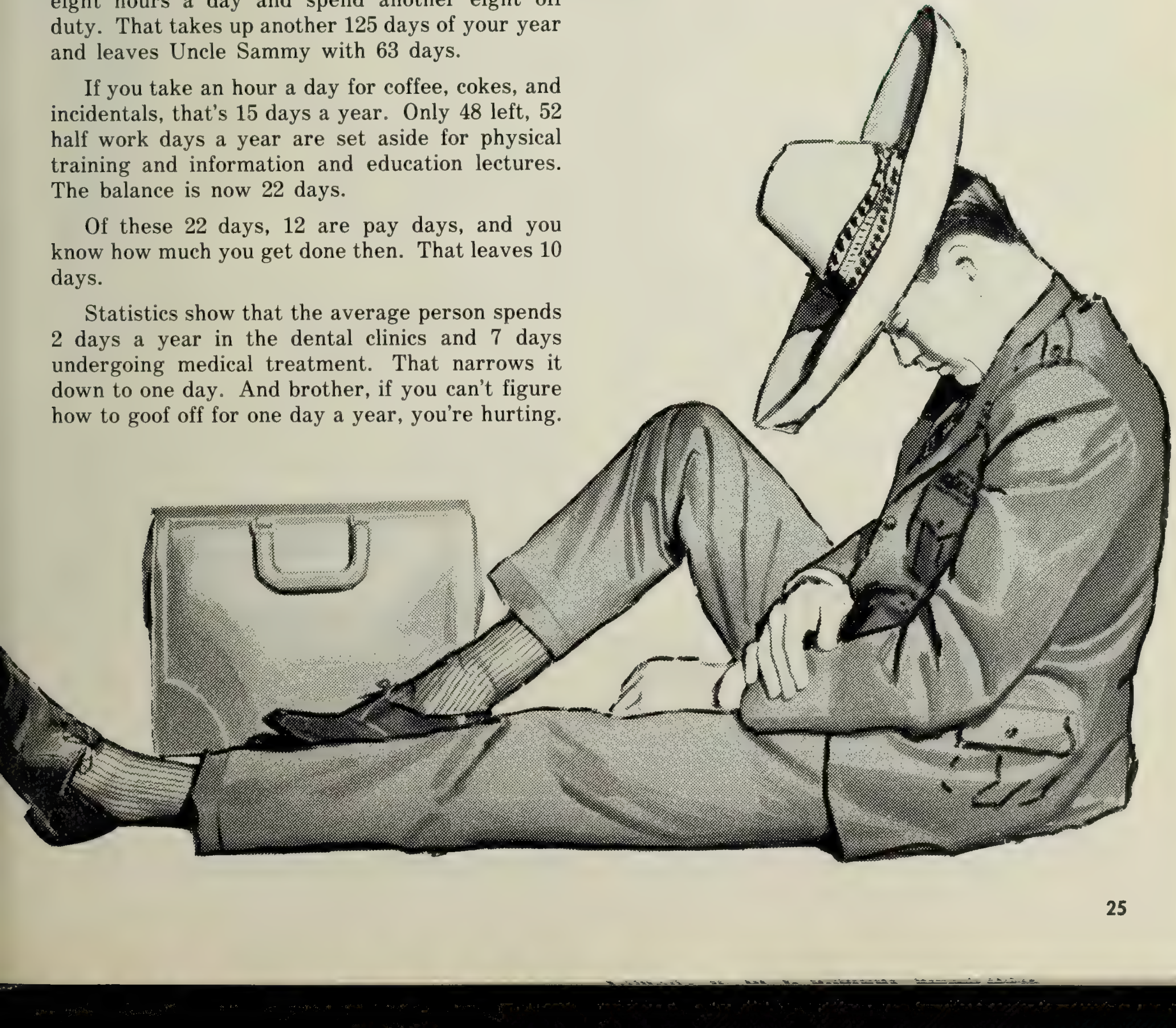
There are approximately 16 National holidays and 104 Saturdays and Sundays. That narrows the balance to 189 days. You sleep approximately eight hours a day and spend another eight off duty. That takes up another 125 days of your year and leaves Uncle Sammy with 63 days.

If you take an hour a day for coffee, cokes, and incidentals, that's 15 days a year. Only 48 left, 52 half work days a year are set aside for physical training and information and education lectures. The balance is now 22 days.

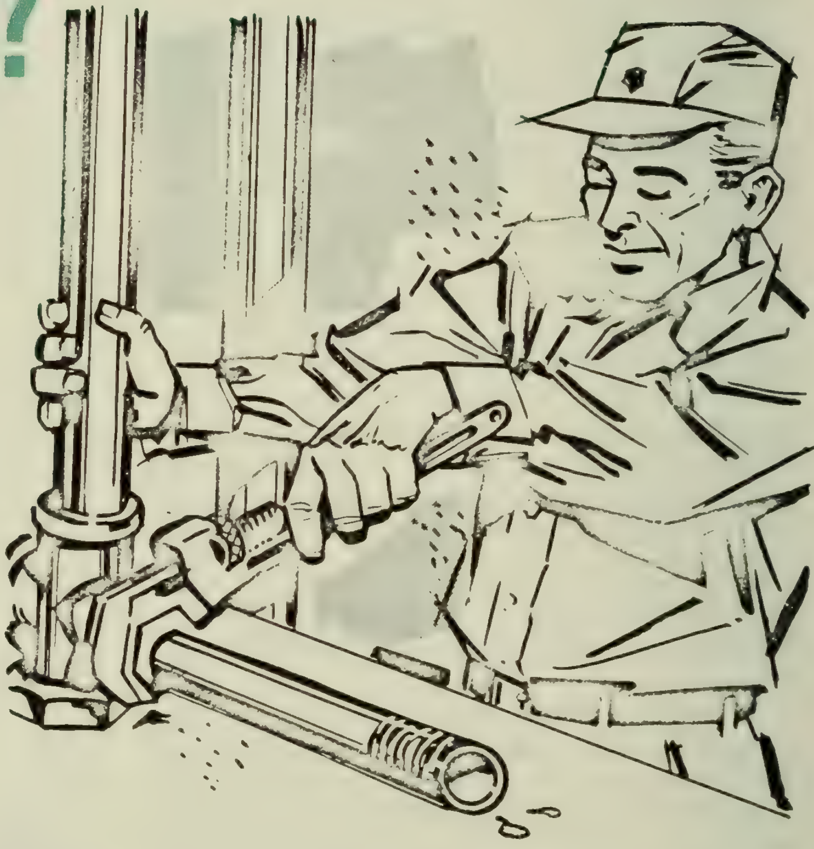
Of these 22 days, 12 are pay days, and you know how much you get done then. That leaves 10 days.

Statistics show that the average person spends 2 days a year in the dental clinics and 7 days undergoing medical treatment. That narrows it down to one day. And brother, if you can't figure how to goof off for one day a year, you're hurting.

Editors Note: This item originally appeared in STARS and STRIPES during the era between World War II and Korea. It was attributed to an Army First Sergeant. He presented it at his retirement ceremony in Wiesbaden, Germany.



YOU GOT A WATER PROBLEM?



MAJ Douglas K. Lehmann

The nineteen seventies have recorded the Engineer distaste for the water supply function. Before you read another word, let me state my unequivocable opinion that this function is and should remain an engineer mission. Second, let me state that my viewpoint is not an official US Army Engineer School (USAES) policy.

The background on the subject is recorded in three studies, which more or less recommend the engineers get out of the water supply business. They are:

1. The West Board Study by Office of Chief of Engineers (OCE)
2. The Bachus Board Study by OCE
3. The AIM Engineer Battalion Study by USAES

The two OCE studies, published around 1971 and 1973, advocated the function to the Quartermaster Corps. The recent 1976 USAES study recommended the five water points in the Armor-Infantry Mechanized (AIM) Engineer Battalion be transferred to the Combat Engineer Battalion, Corps. Additionally, Ft. Bragg is experimenting with transferring the water supply mission to DISCOM. The latter was never sanctioned by the USAES and was upsetting to many members of the Engineer Community when it became known.

The arguments for the transfer revolve around the ten classes of supply which are primarily a Quartermaster function. Why should engineers be in the supply business? This question is shallow to me. The communication-electronics people are in the crypto supply business and the medical folks run their own warehouses. These branches want the function and their cases along with the Engineer are the exceptions that prove the rule. The Engineers are very much in the map supply business. The latter reverts only to the Quartermaster at the DISCOM level and from Corps and above it is all engineer. I venture to say, we are very much in the transportation business, as all barrier materials forward of brigade and division combat training areas are transported by the engineers. So much so, that the ribbon bridge transporter was adapted after the fact with a pallet for cargo.

The specifics of the recommendations are aimed at field operations. Some of the studies keep such activities as equipment development with the Engineers. Some recommendations are impractical. For example, counting both the active and reserve components, there are approximately 20 divisional engineer battalions and 60 corps combat engineer battalions. The USAES recommendation would delete 100 water supply units (5 times 20) and add 300 (5 times 60). The extra 200 are not needed and wasteful. Adding just 1 or 2 per corps battalion would not cover the population and area for water supply. Then there are the problems of insuring that every division deployed has a corps combat engineer battalion with it. I doubt the priorities of combat would allow the latter.

I disagree with the transfer. A function should be deleted from a branch only when one of the following occurs:

1. The mission is no-longer feasible.
2. The mission is superceded by a new mission.
3. The transfer is mutually supportive.

Water is still necessary, potable water has not been replaced nor can we count on it being available in rural areas. No substitute has yet been developed and the Quartermaster Corps does not want the function.

You don't win friends and influence people by trying to pawn your job on them. Such is the case with water supply. It could be argued that the debate was within the engineer family. But that is no longer the case with the Ft. Bragg experiment.

The technical reasons and logic are more straight forward. Water supply is a function of location and not distribution, storage or other element. Water is not neatly boxed, placed on the shelf, and stocked when you get 3 demands in a 180 day period. The DISCOM is seldom located near the best water source. Water supply is unique to engineering because of location and reconnaissance for future locations. Engineers are in positions to locate, emplace, produce, and relocate as far forward as the brigade rear area for the combined arms team.

I suspect one reason engineers are reluctant to accept the water supply mission is that it is a bother, especially a training one in peacetime. Transferring a problem does not solve it. The mission is still essential to combat and must be maintained during peacetime. Location and terrain and thereby water supply are the property of engineers, not exclusively but within our proponency. We, as part of our regular reconnaissance engineer mission, can locate future water supply locations and have the added advantage of being able to provide construction support for access and egress.

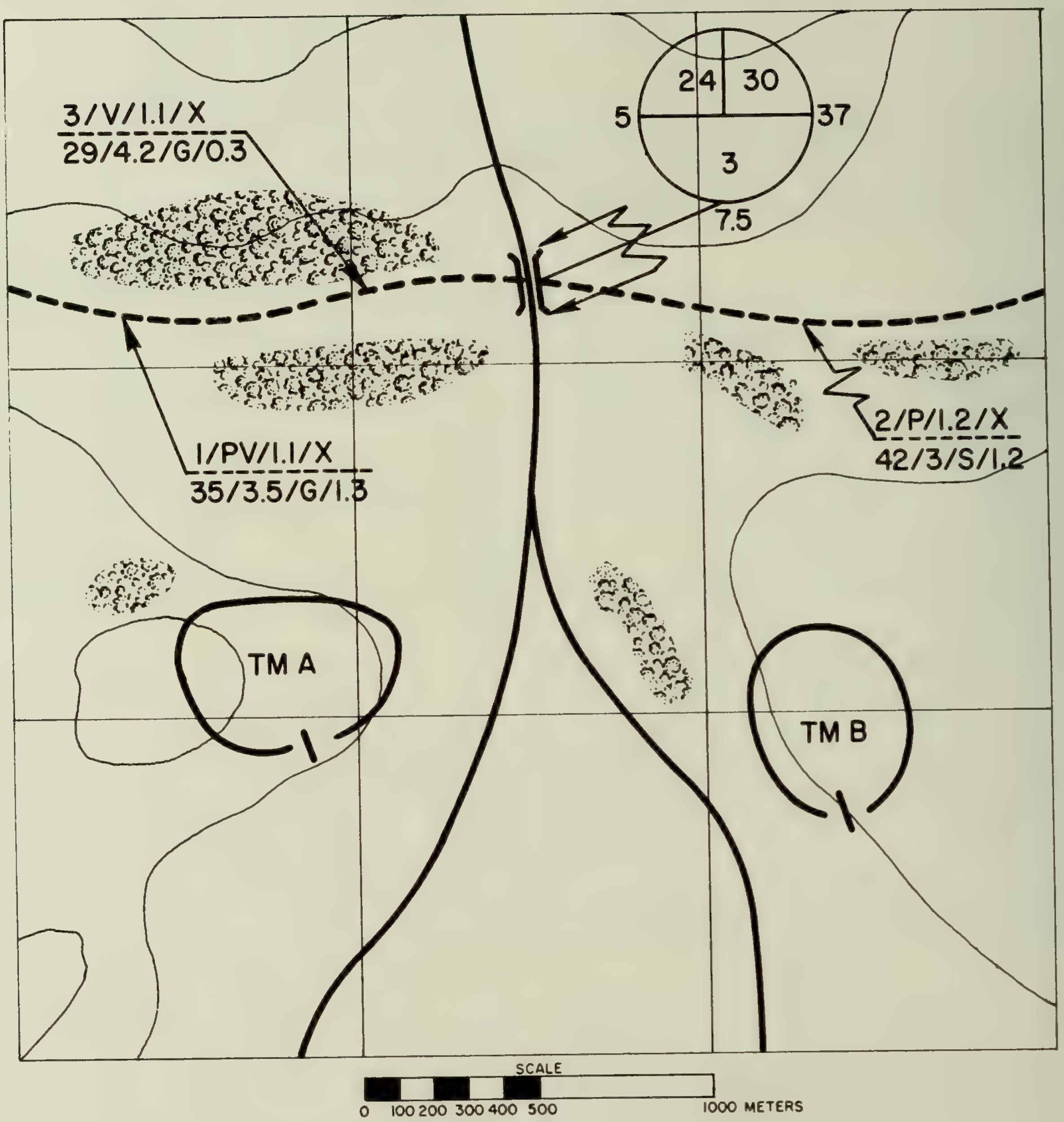
I further suspect the mission is not wanted for lack of knowledge in our officers and senior NCO's. Certainly the knowledge of our water supply specialists is not a problem. These men are one of the finest trained specialties of both the Corps and Army. But the water supply training given to engineer supervisors is lacking. It can be learned OJT by those commanders and S-4 officers who seek it out. Basically it is not taught and therefore not understood.

Lastly, I feel that the Fort Bragg experiment will prove nothing since a peacetime environment is not germane to water supply. The transfer under peacetime conditions would be valid in just about any branch or location. The proper location must be determined subjectively in light of our experiences and the concept of the future battlefield. The conditions that engineers must produce water in are unique to combat.

The time has come to understand this vital mission, support it, and not try to pass it along. Clearly the Corps of Engineers has accomplished its assigned mission in the past and should continue in the future. Water supply is part of that mission.

Major Douglas K. Lehmann holds a BS degree in Forestry from Syracuse University and a MSA degree in Systems Management from George Washington University. He has been a Company Commander in the 97th Engineer Battalion (Construction), Germany and 26th Engineer Battalion (Combat), Vietnam. He also has held additional staff positions in the 8th Engineer Battalion (Combat), Korea, 91st Engineer Battalion (Combat), Ft. Belvoir, and 32nd Engineer Group (Construction), France and Ft. Hood. Since 1969, the major has held successive assignments at Ft. Belvoir of EOAC student; Office of the Director of Instruction, USAES; "Bootstrap"; and USACDC.

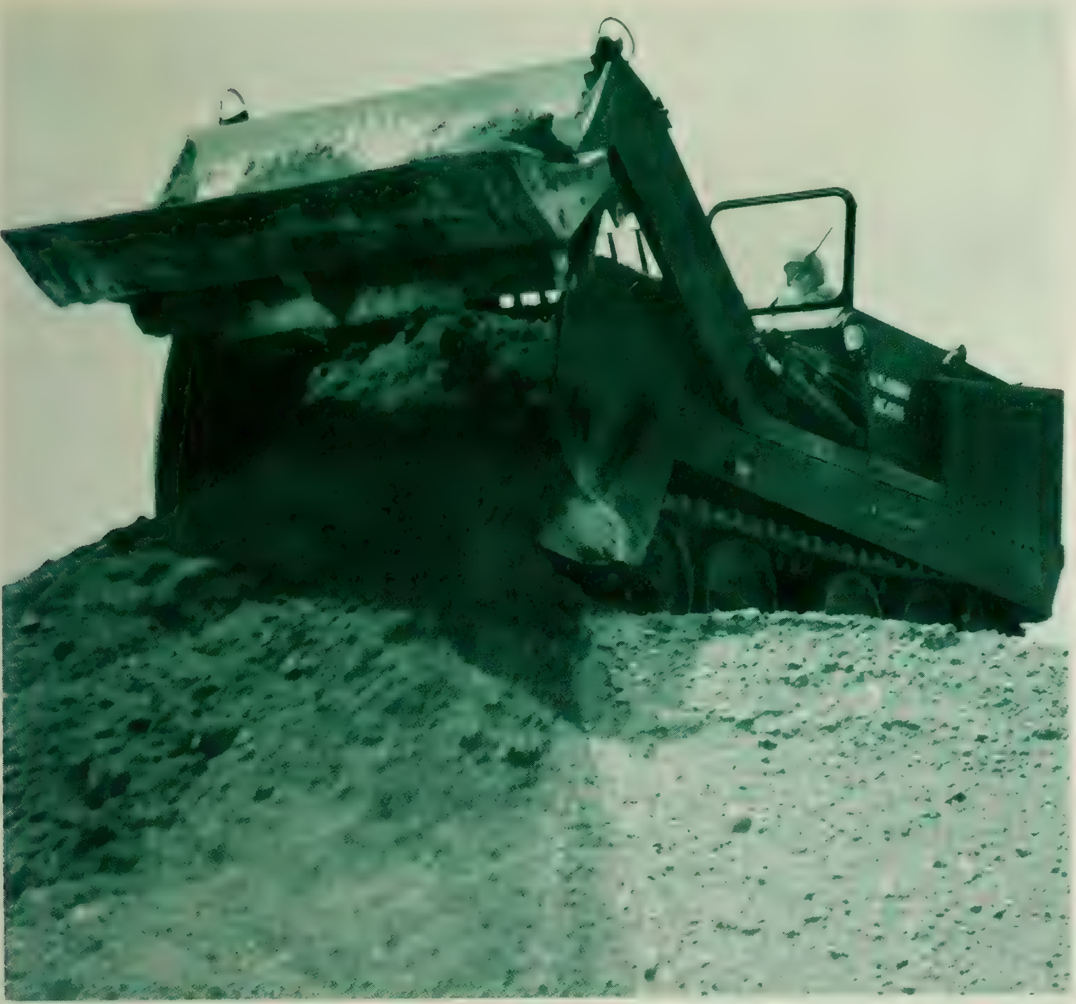
TATICAL PROBLEM



You are the platoon leader from the divisional engineer battalion (mechanized) in direct support of a mechanized heavy task force. The task force has been moved into the sector, part of which is shown on the Sketch Map. This deployment is part of a force concentrating to blunt a breakthrough attack. Intelligence estimates predict an attack by an opposing force motorized rifle regiment within the hour. This regiment contains a tank battalion (40 medium tanks, T62) and three motorized rifle battalions (approximately 100 APC's either BMP or BTR-60 PB).

The task force commander directs you to concentrate your efforts on destroying the bridges and fords. Your estimate reveals you have only the resources and time to either destroy the bridge **or** the fording sites.

Which task do you recommend to the task force commander? **ANSWER PAGE 30**



★

THE UET

An improved Universal Engineer Tractor (UET) developed by the Product Manager, FAMECE/UET at the U.S. Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA is undergoing extensive government acceptance testing at the Aberdeen (MD) Proving Grounds.

The latest version of the UET incorporates all the desirable characteristics of earlier models, such as versatility, mobility and air transportability, plus greater durability and reliability.

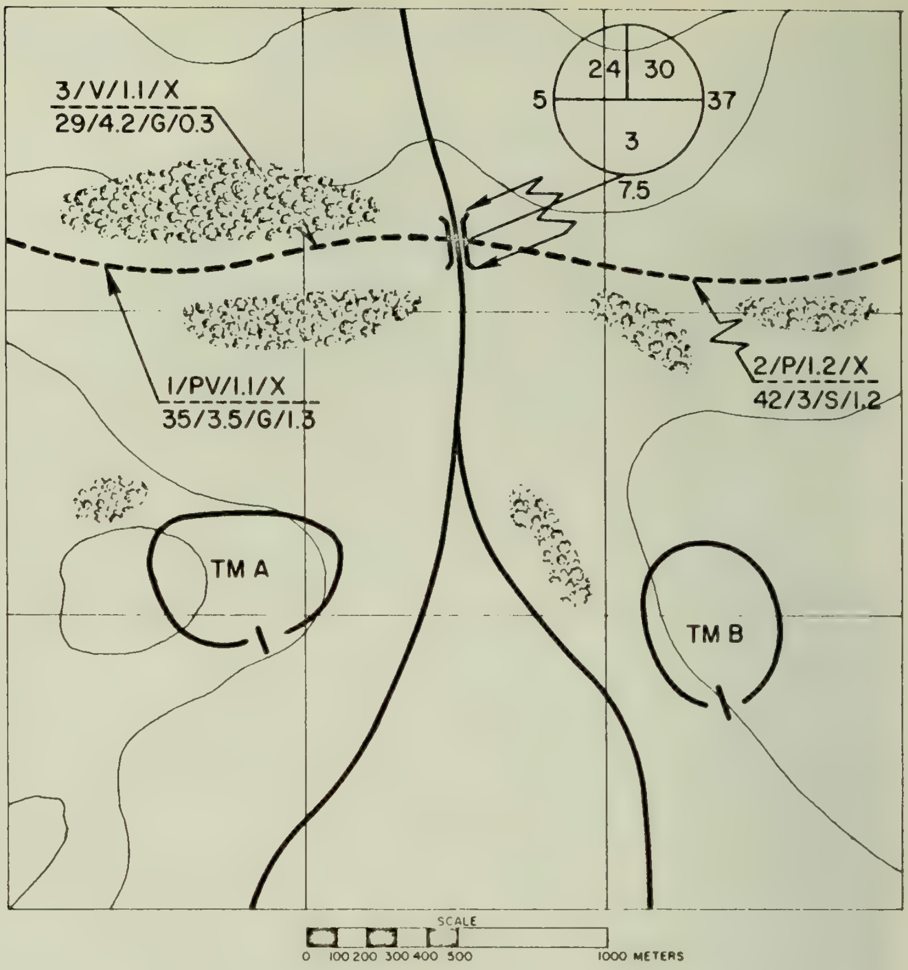
The multi-purpose, tracked UET can doze, scrape, rough grade, tow, dump and haul, to perform the earthmoving tasks required in a combat engineer unit. It features the ballast concept to keep its 32,000 pound weight within the limits for air transport and air drop and high cross country mobility while providing the work capacity of a heavier unit. The front-loaded with 8 cubic yards of soil it provides enough additional weight to almost double the UET's earthmoving capacity.

With a speed of 30 mph on level ground and outstanding cross-country mobility, the UET will, for the first time, provide the combat engineer with the mission capability to travel and to keep pace with armored units. It also is fitted with light armor protection, and has a limited swim capacity of 3 mph.

The scraper bowl is fitted with a hydraulically operated apron and positive load ejector. Dozing and scraping are accomplished by raising and lowering the UET's entire front end by means of the hydropneumatic suspension system. The 285 HP diesel engine provides more than sufficient power for all operations.

The four current pilot models built by Pacific Car and Foundry Company have completed the MASSTER test in December 1975 and are scheduled for completion of APG tests in July 1976. To date test results indicate that reliability problems encountered with previously built prototypes fabricated earlier in the development program have been overcome and that the UET will provide features of mobility, versatility, and maneuverability required to support combat forces.

ANSWER TO OUR PROBLEM



1. Recommend ford destruction.
2. This is deduced from:
   - **a.** the ability of Teams A and B to observe and fire on the canalizing bridge approach.
   - **b.** the reconnaissance symbols which reveal:
     - (1) Fords 1 and 3 may be used by all vehicles capable of fording in depths up to 1.4 meters.
     - (2) Ford 2 is for "pedestrians" only.
     - (3) Bridge 3 has one way capacity of class 30 and two way of class 24. Bypass is impossible while height and width restrictions are 5 and 7.5 meters respectively.
   - **c.** the characteristics of the armored vehicles in the opposing force regiment.

     These include:

	T62	**BMP**	**BTR-60 PB**
Type:	Medium tank	Amphibious armored infantry combat vehicle	Armored personnel carrier
Weight:	40.2 tons	14 tons	11 tons
Fording Depth:	1.4 meters	Amphibious	Amphibious

Therefore, the T62 cannot cross the bridge.

   - **d.** the availability of good concealment for ford use.

The Omaha District Engineer Mural

Michael L. Baugher

During this, our Bicentennial year; cities, organizations, groups and individuals have concerned themselves with a multitude of grandiose activities to celebrate our Nation. Plans ranged from parades, proclamations and fireworks to the planting of time-capsules and a flotilla of high-masters in New York's harbors. Like celebrants, the Omaha District of the U.S. Army Corps of Engineers formed a committee and charged them with the responsibility of a fitting and novel approach.

Among their suggestions was the idea of a mural—a mural that would depict the growth of the Nation and that of the Corps of Engineers. Mastering this scheme was George Barry, a writer-editor for the Planning Division in Omaha. A dabbler in oils himself, he envisioned a time-journey through athe Corps' major contribution to the Missouri River Basin. Included would be the Lewis and Clark Expedition, the development of major railroad routes and the construction of the mainstem dams.

Drawn from the Corps' talent resources, a pair of artists; Bob Irey and Tom Hudson; were commissioned the task. With minimum guidance, Bob set about the job of formulating George's ideas into a living mural.

Since the mural was to depict the events,

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motivation and direction of the Corps, he tried to narrow its emotion and basic attitudes into a unified set of descriptive ideas. Bold, masculine, angular, geometric—all what he felt to be the overriding suggestions of the Corps.

Retaining these emotional assumptions, he began to fill his layout sheet. To the untrained eye, it was a panel of harsh lines—a pencil doodle. But to him, it was the mural. Somewhere within the layout's borders were the events and characters peculiar to the Corps.

The mural was born—there were no colors, no people, no trains, nor dams—but the mural was begun. From this first layout of emotion, he progressed to a series of characters and structures. These now had the continuity of time and direction. They had become tangible to the untrained. Soon he was water-coloring a miniaturized mural. Through this he was able, visually, to determine the impact of each part of this graphic history. While Bob was busied with the minature, Tom was delving into forgotten files, researching subjects for pictorial and historical accuracy.

Jim Brown, Chief Carpenter from the District's Maintenance Base, soon presented the artists with the frame—a three-piece, 24 by 5½-foot superstructure, over which, the canvas and 200 years of Corps history would be stretched. Since no single length of canvas could be found to cover the entire frame, two sections would have to be joined. They both measured, sketched and planned—all in an attempt to choose the least obtrusive junction. They then started to taper—actually sandpaper—the edges of the canvas. When glued and overlapped, the tapered edges combined to a single layer thickness.

Since even the slightest wrinkles and pulls were accentuated by its bulk, the canvas stretching was no little task. Tom and George took turns tightening the canvas from the rear while Bob directed and stapled from the front. With the assistance of an overhead projector to guide with a rough proportional design, Tom applied the first bit of color to the canvas. Not until this moment, seeing the light-brown underbelly of the antelope, had the artists been fully aware of the size of their undertaking. All that white space—more than 130 square feet—was frightening. Progress soon overtook the white starkness as the two men brought the mural to life.

First came the animals in the park, then the

workings of the dam, then the explorers, the water, sky and more. Work was continuous as they removed the blank from the canvas. The artists moved from one area to the next; beginning new work or returning to others to help balance or maintain continuity. To maintain their agreed upon style, each strained under the pressure of compromise—hard work for such artistically individual men. Despite the differences in age, experience and taste, they painted as one. When one became more comfortable with figures and detailed work, the other became his perfect compliment; working with the bolder, more geometric areas of the project.

Soon the entire canvas was covered.

The main themes of expedition, railroads and dams overlapped in time and space to provide a vivid montage of life on the Missouri. Interlaced were scenes through history; and Indian village, settlement expansion, river commerce, power generation, flood control, irrigation, recreation, environment and wildlife.

Finally the artists had a chance to step back and get an overall view of what they had done. They were able to see how differing scenes interacted, how colors directed and how they could improve the mural's impact. Thus began the mural's revision. Whole sections were reworked: portions highlighted, given more weight, toned down, detailed for more realism. The entire canvas took new life. It had been a mural before, but now it boasted direction, motion, emotion.

Slightly more than four months after the mural was proposed, the Omaha District's tribute to the Nation's Bicentennial was completed; its creators proud to have worked on the mural and for the Corps. A graphic history of the Corps and its role in the development of one of the great regions of the United States, the mural now stands on exhibition in the west section of the Main Lobby of the U.S. Post Office and Courthouse in Omaha.

Michael L. Baugher is a Public Information Specialist for the Omaha District, U.S. Army Corps of Engineers. He has worked as a writer-editor for the U.S. Army Recruting Command, Sioux Falls, S.D. and with the Bureau of Land Management in Denver. He served as the PIO for the USAF Survival Schools and as a Public Information Specialist at Lowry AFB, Colo. He attended Santa Ana College, Calif. and the University of Colorado.

SLUFAE-SLUMINE

CPT Terry Krupp
CPT Norviel Eyrich

Current US doctrine for offensive and defensive operations emphasizes the combined efforts of the combat, combat support and combat service support units to insure success. Combat engineers will make their major contribution to the battle by impeding enemy mobility, enhancing friendly mobility and providing greater survivability to the maneuver units through construction of battle positions and protective shelters. A major part of this effort will be mine/countermine warfare — the thrust of this article.

The engineer's capability to adequately support the Combined Arms community is severely constrained by current mine/countermine hardware. This capability will be enhanced by the fielding of two systems currently under development. Utilizing a common carrier and launcher the Surface Launched Unit, Fuel Air Explosive (SLUFAE) and the Surface Launched Unit, Mine (SLUMINE) can accurately be called a revolution in mine/countermine warfare. Both systems are fired from a 30 tube rocket launcher mounted on an M548, 6 ton, full tracked cargo carrier. The system can either emplace or breach a minefield and will have mobility comparable to that of the supported armored/mechanized units. Basis of issue will be two per company in the divisional engineer battalion and one per company in the Corps Combat Engineer Battalion. Current planning calls for a resupply vehicle, and a four man crew to support each SLUFAE/SLUMINE system. The system, in either mode, can be positioned and fired within 10 minutes and reloaded with a full 30 round load within one hour.

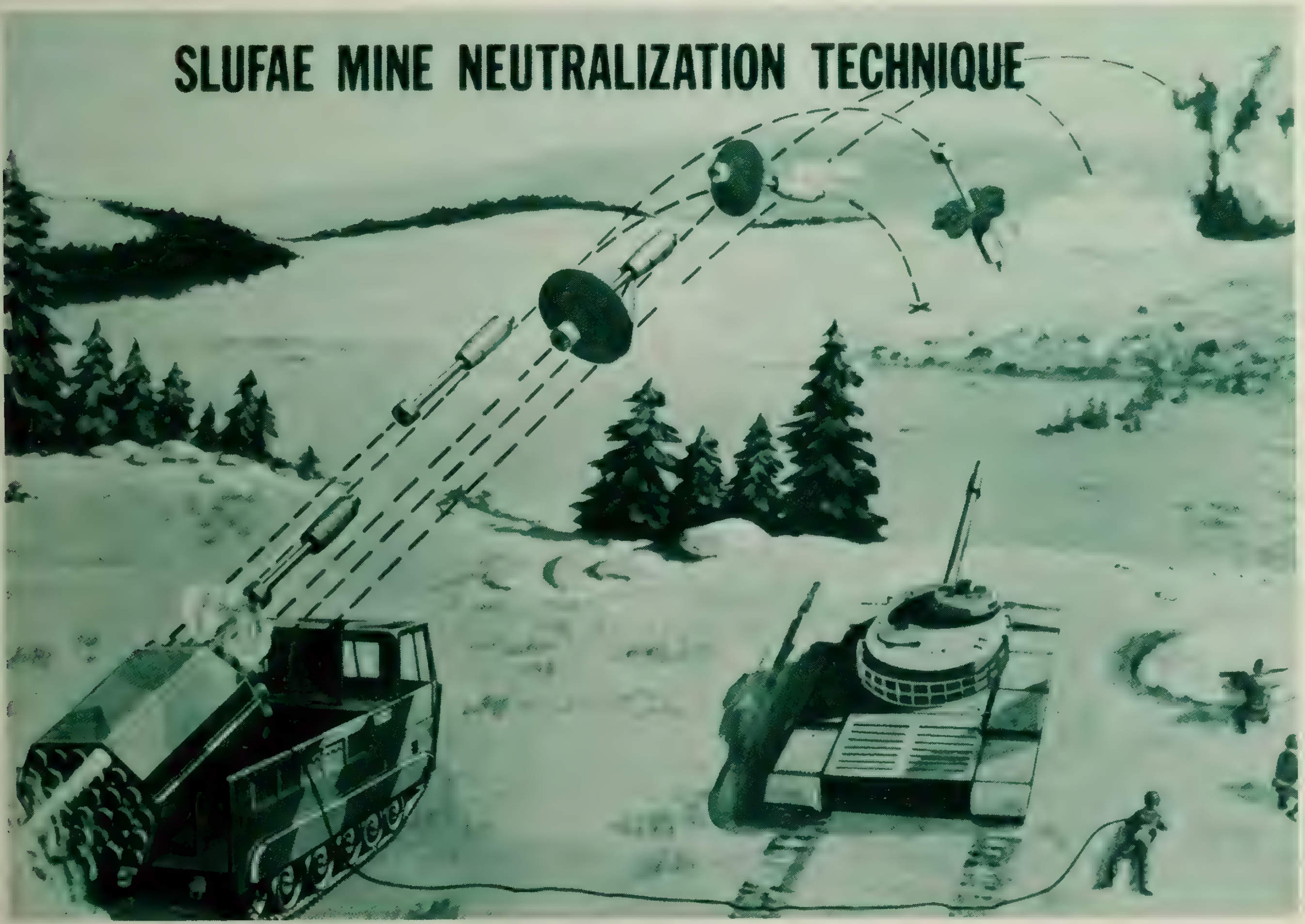
As an example of the conceptual employment in both modes a short scenario will be presented to illustrate employment techniques and the impact of SLUFAE/SLUMINE on the FM 100-5 battlefield. B/132d Engineer Battalion is supporting Task Force (TF) 1-72 which is conducting a counterattack to secure a key ridgeline. Reconnaissance has revealed a large enemy mined area which is covered by observation and fire. The task force commander has decided to attack with two companies leading and the third company trailing in the center sector ready to reinforce either company in order to maintain the momentum of the attack.

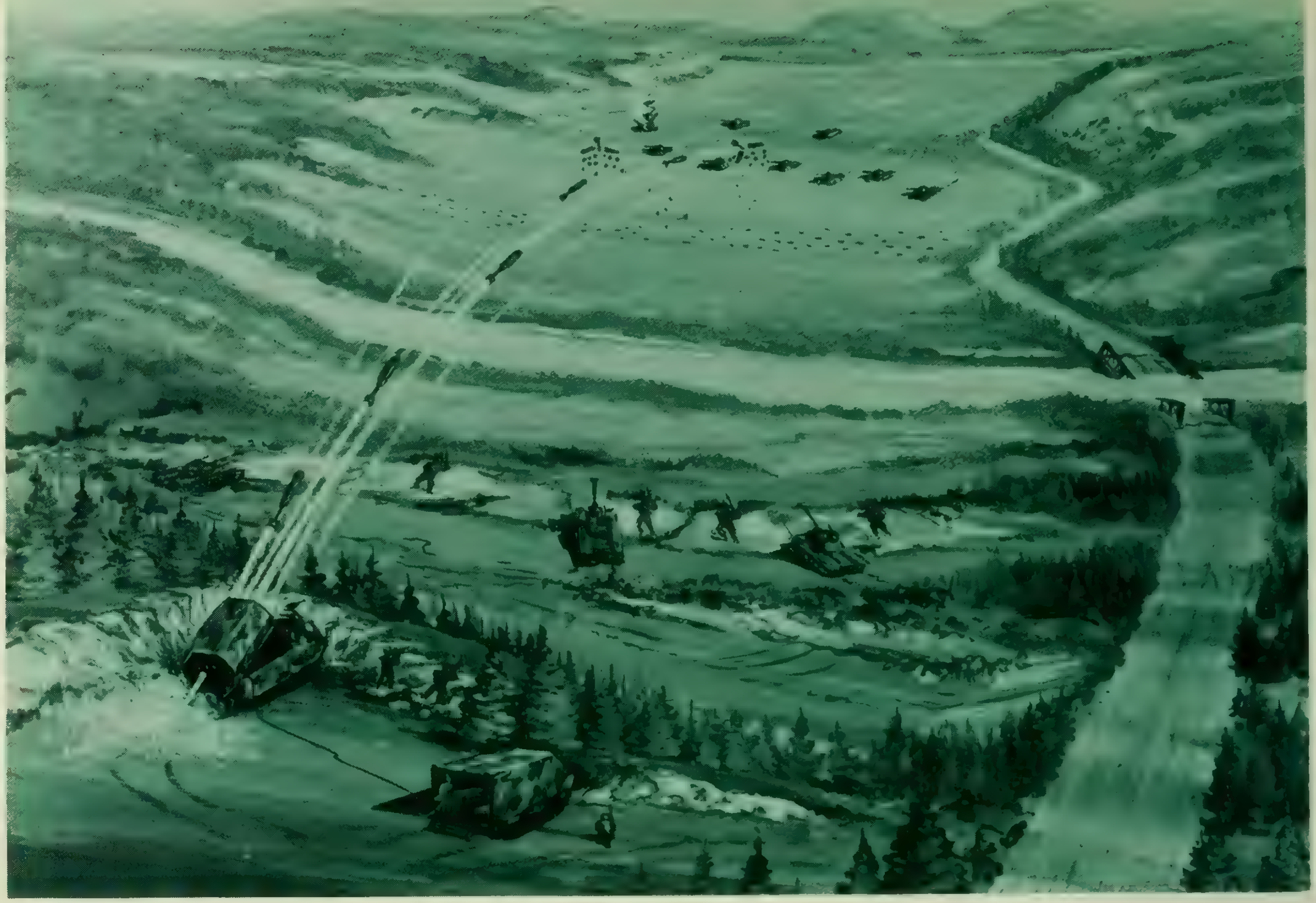
After receiving the task force commander's concept of operations, the engineer company commander analyzed those tasks which his company must perform to support the task force counterattack. During the assault phase the engineer tasks will consist of creating two assault breaches in the previously located minefield and being prepared to breach any unknown minefield encountered. After the objective has been secured, engineer tasks will consist of emplacing hasty obstacles and assisting in the preparation of battle positions, to repel an enemy counterattack. No other tasks were identified based on current intelligence and available time.

Based upon the task analysis and available resources, the engineer company commander recommended that one launcher loaded with FAE rounds accompany each of the two lead companies and be located near each maneuver company headquarters element for immediate response. In coordination with reconnaissance elements, available photos, and a map analysis, possible firing positions were located along each attack route to insure maximum protection and to take full advantage of the SLUFAE's stand-off capability distance (up to 1000 meters from the far edge of the mined area). When the objective is secured both launchers will be reloaded with 30 mine rounds, and then located in protected positions from which they can emplace mines in support of the task force's defense during an enemy counterattack. The recommended launcher positions for the mine role were coordinated with the TF S-3 so that mines could be immediately placed on the approaching enemy force on the two most likely avenues of approach. At a subsequent meeting the recommendations were briefed and integrated into the task force commander's battle plan.

At 0130 the attack began against heavy enemy fire. The launchers with FAE rounds moved from protected positions to their supporting positions along concealed routes using the terrain to insure maximum protection. The launcher and crew immediately prepared the launcher by aligning it on the proper azimuth, elevating the launcher tubes and entering the firing data. Concurrently, the lead maneuver elements neared the previously located minefield and at the direction of the unit commanders, 15 FAE rounds were fired into the minefields. Upon impact in the minefield, each round formed a cloud which when detonated, neutralized all mines through the blast and overpressure effects. The result was a breach 8 meters wide for the entire depth of the minefield. Shortly afterwards both companies encountered minefields not previously located. In less than 10 minutes, both launchers were again positioned, aimed, and fired to breach the enemy minefields. An artists concept of SLUFAE employment is presented in Figure 1.

The counterattack was successful due in great part to the minimal delays created by the enemy's





obstcles, and subsequent reduced effectiveness of supporting direct fire weapons. During consolidation both launchers were reloaded with MINE rounds and positioned to support the task force while other elements of the engineer company were assisting the preparation of defensive positions.

At 1500 hours, the enemy counterattacked in strength lead by a major tank element. As the battle reached a critical phase with the US forces, outnumbered by more than 3 to 1 in firepower, the task force commander ordered one launcher to fire mines on and in front of the advancing enemy and the other launcher to standby. The mines slowed the enemy sufficiently so that the antitank weapons systems of the task force were able to engage the targets and ultimately defeat the attacking enemy unit. An artist concept of SLUMINE employment is presented in figure 2.

The SLUFAE/SLUMINE system will, when adopted by the Army, be incorporated into engineer units in the early 1980s. As can be seen from the scenario presented in this article the system will provide the engineers with a highly mobile responsive system for mine/countermine warfare and greatly enhance the combat effectiveness of the combined arms team.

CPT Norviel Eyrich graduated from the United States Military Academy in 1969 and was commissioned in the field artillery. He is a graduate of the Field Artillery Basic and Advanced Courses. CPT Eyrich spent two and one-half years in the 7th Bn 16th FA, Baumholder, Germany where he served as assistant S-3, Battery XO and Battery Commander. He served as senior RF/PF Advisor, MACV Advisory Team 36, Republic of Vietnam. Prior to his current assignment as ORSA Project Officer Concepts and Studies Division, Directorate of Combat Developments, CPT Eyrich completed his Masters Degree in ORAS at Georgia Institute of Technology.

CPT Terry Krupp graduated from the Colorado School of Mines in 1971 with a Bachelor of Science in Chemical Engineering, and was commissioned a 2LT in the Corps of Engineers. He is a graduate of the Engineer Officer Basic and Advanced courses. Previous assignments include; platoon leader, 902nd Float Bridge Company and Construction Officer, 44th CBT Engineer Bn (Heavy), Korea. Prior to his current assignment as ORSA Project Officer in Concepts and Studies Division, Directorate of Combat Developments, CPT Krupp completed his Masters Degree in ORSA at Polytechnical Institute of New York.

BRIDGING THE GAP

MORE ON PROPOSED DIVISION REORGANIZATION

If the Army adopts the new division reorganization plan now under study, the division engineer battalion will drop the present division's bridge company, and will add more combat engineering equipment. More armored Combat Engineer Vehicles, (CEV) would be added, along with Surfaced Launched Fuel Air Explosives (SLUFAE), and Surface Launched Mines (SLUMINE).

The changes would give the engineer battalion a larger role in boosting the mobility of the division, according to staffers of the TRADOC-based Division Restructuring Study Group (DRSG). The added combat engineering equipment would also serve to inhibit the mobility of enemy combat formations, say DRSG planners.

If the proposed organization gets the official nod from the Army, the division's logistical organizations will also be in for some streamlining. The logistical base of the division would be more oriented to sophisticated modern weapons. More repair and technical services support will be pushed forward to the combat units.

Some testing of the proposed reorganization plan will begin early next year.

SOME COMMANDER'S DENIALS ARE NOT OK

DA officials say that soldiers are being denied promotion and taken off promotion lists, with no authority, in the field.

The problem stems from the fact that some commanders are imposing additional, local, eligibility and promotion criteria which is against regulations, paragraphs 7-1.1 and 7-14 or AR 600-200.

As an example, some company commanders are delaying recommending E4s for the E5 board because they had not attended the Primary Noncommissioned Officers Course (PNCOC). In addition, some boards were not selecting soldiers for promotion because they had failed to complete PNCOC. This action is unauthorized.

Under EPMS, PNCOC will become a requirement for promotion to E5 in some MOSs. Commanders can't impose this requirement criteria until it has gone into effect Army wide.

The commander must judge future potential, and may use failure of PNCOC or other courses as one of the reasons for possible non-recommendation for promotion. Failure, alone, should not lead automatically to non-recommendation. Commanders are not allowed to deny a promotion recommendation solely because a soldier has not attended a PNCOC.

As far as removing a soldier from a promotion list, a soldier can be removed for cause, one of which might be failure to pass a course such as PNCOC, but a determination must be made by a board as referenced in paragraph 7-27, AR 600-200.

In addition, board members should not use failure of a course as the only reason for non-selection of a soldier.

Additional local promotion criteria can not be established because it is unfair for some soldiers to meet criteria which is not required of other soldiers.

The heart of the matter revolves around the fact that the individual commander does not have the authority to impose his own, local, eligibility and/or promotion criteria.

Junior E4 Housing

It's official, E-4s with more than two but less than four years service who don't have a six-year active duty commitment will now be considered equal with other E-4s when it comes to post family housing.

In the past, these individuals had virtually no chance of ever being assigned to family housing. Posts should receive implementing instructions by early September through the pinpoint distribution system. These are effective upon receipt.

They may look like tramps, But they build your camps, And they sometimes lead the advance.
And they sweat red blood to bridge the flood, To give you a fighting chance.
Who stays behind when it gets too hot, To blow up your roads in the rear?
Just tell your wife that she owes your life to some muddy old ENGINEER.
Some dusty, crusty, croaking, joking, muddy old ENGINEER.

A BRITISH SAPPER

Although he can't create miracles, When there goes up a hew and cry;
Being an ENGINEER means he'll give it a damn good try.

Essayons is a statement clear, That to him means a hell of a lot;
It's not to say or evem imply, That he's doing something he's not.

No fancy badge to hang on his chest, Though laurels he doesn't abhore;
His castle will gain him entry, When he walks to that golden door.

For the first to arrive, and the last to leave, the muddy old ENGINEERS
The sweating, go-getting, uproarious, glorious, muddy old ENGINEERS.

AN AMERICAN ENGINEER

Engineering

Y

THE ENGINEER

JAN FEB MAR 1977

HAPPY BIRTHDAY TO ALL

DEPOSITORY

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CHIEF'S BRIEFS

Brigadier General William Price Craighill was born in Charles Town, West Virginia, July 1, 1833. He was graduated from the United States Military Academy on July 1, 1853 and promoted Brevet Second Lieutenant, Corps of Engineers.

Following several seacoast fortifications assignments, Craighill was Assistant to the Chief Engineer from 1856 to 1859. In 1858 he directed construction of Fort Delaware.

During the Civil War Craighill was a division and corps Chief Engineer, a member of boards for the defenses of San Francisco and New York, and a Professor of Engineering at West Point. On March 13, 1865 Craighill was brevetted Lieutenant Colonel for faithful and meritorious services, particularly for services in the defense of Cumberland Gap.

After the war Craighill served as Southeast Division Engineer subsequent to membership on numerous boards for coastal defense and rivers and harbors improvements. President Cleveland appointed him Chief of Engineers on May 10, 1895.

Retired in 1897, General Craighill died at Charles Town, West Virginia on January 18, 1909.

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ABOUT THE COVER

We of the Staff of The Engineer wish o take this opportunity to wish the orps a "Happy Birthday" once again. t is, quite by chance, also the Birthday f The Engineer Magazine. Yes, Folks, ix years ago today, this humble little ublication made it's debut. Just like he Corps, we've had some good times nd some bad times, but just like the orps, we're still around. Essayons.

.PIPELINE. PIPE

ENGINEER DEVELOPMENT PRIORITIES TO WIN THE FIRST BATTLE

To insure that engineer developmental guidance and priorities are in proper order to "win the first battle," The Engineer School has developed a study initiative to redefine the role of the engineers in the combat area. The study objective is to determine changes in doctrine, training, organization and material developmental priorities necessary to maximize the engineer contribution to the combined arms team.

To be responsive to the needs of the Army in the field, the study will provide a comprehensive analysis of the engineer requirements and set the direction for the developmental efforts in the engineer community.

The study will be a combined effort bringing together the talents of the Engineer School, the Combined Arms Center at Fort Leavenworth, the Engineer Study Group of OCE and various analytical agencies of TRADOC and the military community.

NATIONAL ENGINEERS' WEEK display illustrated bridges in Army history was viewed by Cheri Moore of Fort Belvoir's Mobility Equipment Research and Development Command. This was one of five displays MERADCOM was showing in the Northern Virginia area to depict the activities, contributions and challenges of men and women in science and engineering. Co-sponsored by the Virginia Society of Professional Engineers, the exhibits were shown at the Annandale and Alexandria branches of Northern Virginia Community College; George Mason University; Tyson's Corners Shopping Mall and Pentagon Concourse.

NEW RADAR SYSTEM DETECTS SURFACE MINES

The standoff detection of surface mines in being achieved with the use of a new radar system, being developed at the US Army Mobility Equipment Research and Development Command (MERADCOM), Ft. Belvoir, VA.

Called METRRA, for metal re-readiation radar, the experimental system being developed by the US Army can detect surface mines from a helicopter or other aerial platform ahead of advancing troops.

METRRA also locates booby traps, munitions, armed troops and vehicles. It can locate

LINE. PIPELINE.

targets that do not emit heat and it does not require target movement for detection. METRRA operates through rain, fog and can penetrate dense foliage.

The present Airborne system uses a transmitting and a receiving antenna mounted on the side of a helicopter. Monitoring equipment inside the craft displays and stores terrain and target information.

In operation, VHF radio waves transmitted outward reflect off the surface and return at the same frequency giving a picture of the terrain. Small amounts of VHF energy change to a harmonic frequency as they reflect off the junctions of metal parts or semi-conductors of possible targets. For example, electronic parts in air-scatterable mines are detected and displayed on the METRRA monitor.

In addition to the Airborne METRRA, a portable backpack unit is being developed for use by ground troops. This unit is desgined to detect surface laid mines and booby traps at safe distances.

METRIC SYSTEM USE DIRECTIVE SIGNED

Total conversion to the metric system is one step closer. Deputy Secretary of Defense William P. Clements, Jr., recently signed a DoD directive which will govern DoD use of the metric system of measurement.

The directive—number 4120.18—calls for progressive adoption of the system within DoD. It also directs that DoD keep abreast of conversion activities within the U.S. industrial community.

It provides for use of metric units in design of new weapon systems and equipment when there are no significant technical or cost penalties. However, the conversion of existing designs is discouraged.

The directive conforms with Public Law 94-168 which provides for coordinating increased use of the metric system. DoD officials say that many defense-related industries are converting or planning conversion to the metric system.

The new directive will permit more effective NATO standardization and encourage joint production programs. The U.S. has been the only member of the NATO alliance to use non-metric units of measure.

REPTRAIN COMBAT ENGINEERS

Army reservists qualifying to be combat engineers recently took part in a unique training program with the 27th Engineer Battalion here.

Unique because, although Ft. Bragg provides neither Basic Combat Training (BCT) nor Advanced Individual Training (AIT), 120 reserve recruits were learning all about the Army and combat engineering in their 12-week stay.

The program was part of Reserve Enlistment Program Training (REPTRAIN), an experiment in one-station training at 11 different Army posts in the U.S. It was designed by U.S. Army Forces Command (FORSCOM) to help alleviate backlogs of recruits coming into the National Guard and Army Reserve, and to provide relevant, "hands-on" training.

Young recruits learned exactly what "hands-on" training was all about, as they whisked from six weeks of BCT into another six weeks of AIT in combat engineering.

The intensified blocks of instruction familiarized trainees with all the equipment and tools available to both Combat Airborne and Combat Heavy Engineer Battalions (20th Engineer Brigade.)

The secondary mission of the combat engineer—to fight as infantry—was incorporated into the program and taught by Green Berets of 7th Special Forces Group at Ft. Bragg.

While Green Berets were teaching the men squad level tactics and M60 machine gun firing, the engineers were teaching them the basics of float and panel bridge construction.

REPTRAIN students got their share of "hands-on" training—from installing anti-tank mines to constructing an overhead cover bunker and wire entanglements.

When the training was over, 120 combat engineers were graduated at the U.S. Army Reserve Center here with a 91.6 percent grade point class average.

SIR:

Who is responsible for the retention part of Recruiting and Retention? Command briefings from company level on up increasingly emphasize R&R. The unit commander usually says, "My Personnel Officer (XO, S-1) will discuss R&R". This individual usually introduces a junior officer as "The R&R Officer". The briefing consists of details of the leader's responsibility (down to squad level) for recruiting. Production centers are established and monthly quotas are set. A blow by blow description of the body count statistics follows. The next briefer is then introduced.

What happened to the Retention part of the job? The usual reponse to this question is shocked silence. Next follows several comments as to the commonly accepted conclusion that the individual training received usually determines re-enlistments. Those individuals whose personal needs have been identified and satisfied, and who were challenged and succeeded, usually re-enlisted. Financial shortfalls mis-match of Army and personal needs dropped some of them but many just lost interest. They say the Retention part of the program is therefore obvious. Is it?

We cannot assume that a definite relationship exists, and is understood, so long as the Personnel Officer addresses only the first R when he advertises responsibility for both. He is responsible for the paperwork of re-enlisting, but this is not a "Retention" program.

Let's not get so wrapped up in short term quotas that we lose sight of the need for a long range training plan closely coordinated with retention. The commander must develop and enforce an R&R program which fully integrates both pieces of the pie. This must start with a new analysis of the concept of a single (junior) R&R officer. If this really is just a recruiting officer, then who is responsible for Retention?

GENE B. FEE
LTC, CE

SIR:

Following negotiations lasting more that one year, arrangements have been concluded which permit qualified candidates for the Engineer-In-Training (EIT) and Professional Engineer (PE) to be tested for State of Minnesota professional engineer registration while stationed in Central Europe. Testing is open to qualified civilian employees and military personnel from all branches of the service who otherwise meet the qualifications set forth by the State of Minnesota.

Heretofore, only Pennsylvania offered an examination service operated through the Navy's Officer in Charge of Construction (OICC) located in Spain. The latest program, offered by the State of Minnesota, conducts testing at Heidelberg, West Germany.

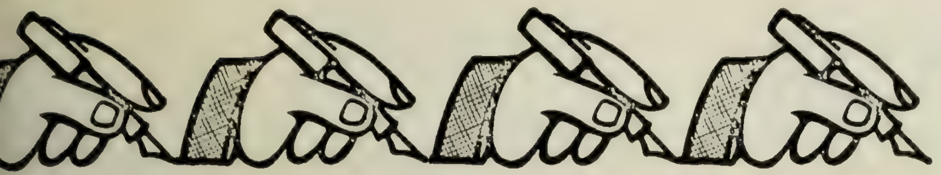
To date, the EIT examination was given on 18 September 1976 and again with the PE on 6 November 1976 involving a total of 15 candidates. The calendar for 1977 calls for the two exams to be given on 16 April and again on 5 November 1977, at Heidelberg.

This program has gained considerable attraction to US civilian and military engineers throughout the US Army, Europe, and Seventh Army area. Persons expecting orders to USAREUR and Seventh Army should contact the Executive Secretary of the State of Minnesota Board or the Test Program Coordinator in USAREUR for further information, including prerequisites and requirements:

The examinations administered by the State of Minnesota are prepared by the National Council of Engineering Examiners (NCEE) and afford reciprocal opportunities with other states and jurisdictions which recognize the NCEE EIT/PE registration program.

Since no formal preparatory program is established in the USAREUR area, persons interested in the State of Minnesota EIT/PE Examination Program should contact the US Army Engineer School, ATTN: Department of Military Engineering, Fort Belvoir, Virginia 22060 for information about the several non-resident correspondence course programs offered there.

Professional registration, once attained, offers the beholder a great feeling of pride and professional accomplishment. It also makes the person



Stop 16

a more valuable member of society—on the micro-scale to his immediate environment and on the larger micro-scale to society as a whole! Become a total professional—become registered!

PAUL J. THEUER, P.E.
LTC, GS (CE)
Executive Officer,
ODCSENGR
HQ USAREUR and
Seventh Army

I was pleased to see Maj Lehmann's comments in the Fall 1976 issue concerning my 1975 article "Are Engineers Really Different?". I was beginning to believe that the only readers of the article were those poor souls under my direct supervision!

The genesis of the article was an attempt to present a logical explanation of engineer command and control functions to the Air Defense Artillery Officer Advance Course students. I believe that the use of tables to outline the procedures was an original approach. To my knowledge, the first use of tables in engineer doctrinal literature was the publication of FM 5-X in 1976. I wholly support this doctrinal attempt to outline and simplify our combat support doctrine. However, the proposed doctrine still contains items I feel obligated to question.

For example, the table from FM 5-X, reprinted in Maj Lehmann's letter, has the first column titled "status". What is meant by this term? Is it the "status" found in the Task Organization, or the "status" found in paragraph 3 of an operation order? It appears to be a combination of both. Why? The common thread which was intended to run through my article was the ordering of engineer employment in accordance with the mental process one must go through in writing a five paragraph operation order. Many historical examples of student handouts furnished by USAES did not go through this rigorous process. In writing an operation order one must complete a task organization, delineating command relationships, as well as specify missions for subordinate units. This mental process is ignored by the table in FM 5-X as a result of using the imprecise term "status".

Other examples attempting the continuation of doctrinal confusion is reflected in the letter. How does the continuation of the term "work assignments" fit into the operation order mental process? Maj Lehmann is emphatic in stating that the current grouping of support relationships and work assignments cannot be combined to form mission assignments. Why? I submit that maintenance of the doctrinal status quo is not a valid reason.

I am boldly prompted to ask that if the current doctrine is so straightforward, why Maj Lehmann must admit "It is unfortunante that what is a very simple system is misunderstood by many"?

One last comment on the letter. How can Maj Lehmann make the judgment that FM 101-5 is wrong in stating the "DS" is a command relationship? Does he know of a change in the operation order fomat not yet distributed to the field?

In reality, my pride of authorship in these matters is secondary to realizing that a dialogue is taking place during this exciting period of change in the Army. These and other questions are being asked, and some real progress is taking place. Whatever the final outcome concerning engineer command and control procedures, all one pleading voice from Fort Hood requests is the establishment of a system which:

1. Is simple and can be understood by non-graduates of the Engineer Officer Advanced Course.

2. Eliminates "Fort Belvoir Only Terms" such as "EWL", or else places such terms in doctrinal literature.

JOSEPH P. KISH
MAJOR, CE

ANTI-TANK DITCHES

LTC Frederick A. Perrenot

The opening battle in a European war will be a wild, swirling affair. Large concentrated formations of Warsaw Pact armor, moving at high-speed, backed by formidable quantities of artillery, will be faced by greatly outnumbered Allied defenders. Our defender commanders will be rapidly shifting their forces to reduce the local odds to manageable proportions, to prevent or limit deep penetrations. Our forces will be employed well forward, with minimum reserves available. Tactical decisions must be timely and correct. We *must* win the first battle—there will be no room for mistakes.

As the enemy force approaches, it will be moving to contact at a high rate of speed—measured in hundreds of meters per minute. At certain points along the line, he will have his forces arrayed in penetration formations. At these points, the density of armored vehicles will be extremely high—as many as 50 or more per kilometer in the leading wave. This will present a high arrival rate of targets which the greatly outnumbered defenders must engage (Fig 1). The defending commander is then faced with four major tasks:

- Recognize the existence and location of the enemy penetration attempt.
- Handle the arrival rate of targets with forces on hand.
- Concentrate his supporting fires.
- Laterally shift forces from adjacent units to even the odds.

The Soviet tank and armored personnel carriers *can* be delayed and even stopped by a fresh approach to an old concept—*The Anti-Tank Ditch.* They were used extensively, and successfully, in World War II and recently in the 1973 Mid-East War. An extensive anti-tank ditch, when adequately covered by direct fire may even the odds between the outnumbered defenders and a massive armored attack force. How can this be accomplished? Read on!

The odds begin to even as the attacking wave hits the ditch. What is the full impact of the ditch on a large attacking formation? Does it synergistically improve the defensive capability? First, let's look at the attackers side of the battle. His recipe for success depends upon speed and mass. He does not want to be bogged down and will bypass stubborn resistance in order to maintain momentum. His basic maneuver fire unit is the tank platoon. He wants to close to relatively short range and to overwhelm the defenders with numbers. In fact, the T-62's smooth bore main gun with stadia sight is designed for close in, high volume fire rather than the long range stand-off tactics of the defender.

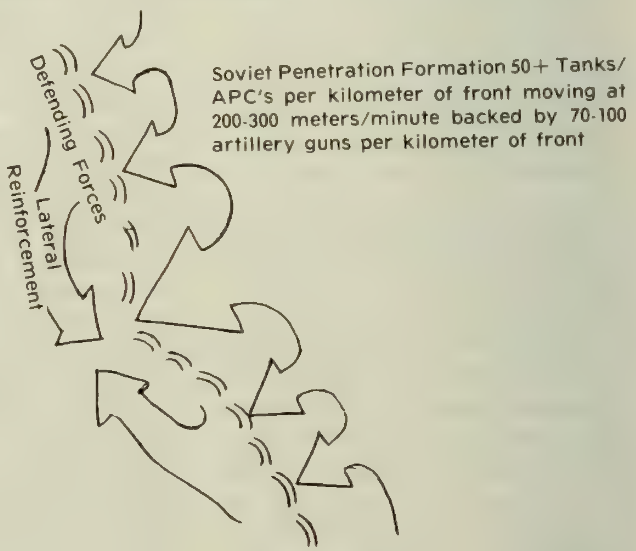
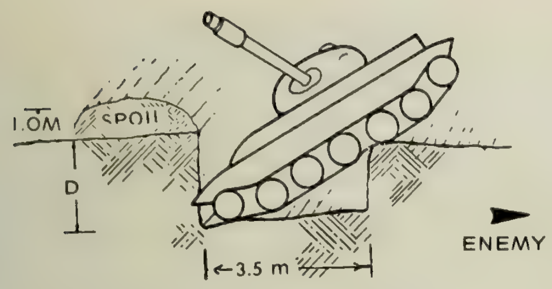

Defending Forces
Lateral Reinforcement
Soviet Penetration Formation 50+ Tanks/APC's per kilometer of front moving at 200-300 meters/minute backed by 70-100 artillery guns per kilometer of front

FIGURE I

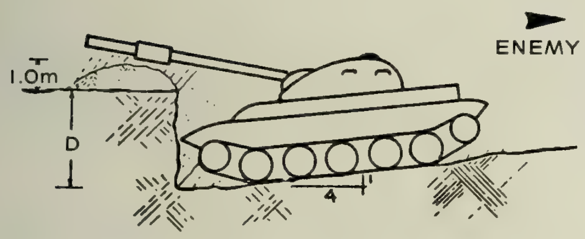
The defending commander, greatly outnumbered, must **quickly** recognize the penetration attempt, handle a large number of targets with local forces on hand, concentrate his supporting fires, and make lateral reinforcement, **before** being numerically overhelmed. Anti-Tank Ditches can help him.

On the other hand, the outnumbered defender has designed his tactics and weapons to stand-off at long range and destroy as many enemy armored vehicles as possible, shifting his forces to meet concentrations, all the while attempting to prevent being overwhelmed by numbers. The defending commander must have *time* to recognize concentrations and react accordingly. His tank guns and anti-tank missiles are designed to support these tactics with long range fire.

LTC Frederick A. Perrenot is currently assigned to the ODCSOPS, USAREUR and 7th Army. In his previous assignment he was Commanding Officer, 94th Engineer Combat Battalion (Heavy), 24th Engineer Group in Germany.



RECTANGULAR DITCH



TRIANGULAR DITCH

D = 1.2M FOR 2 MIN. DELAY AGAINST T-62
(ESTIMATED)

FIGURE 2

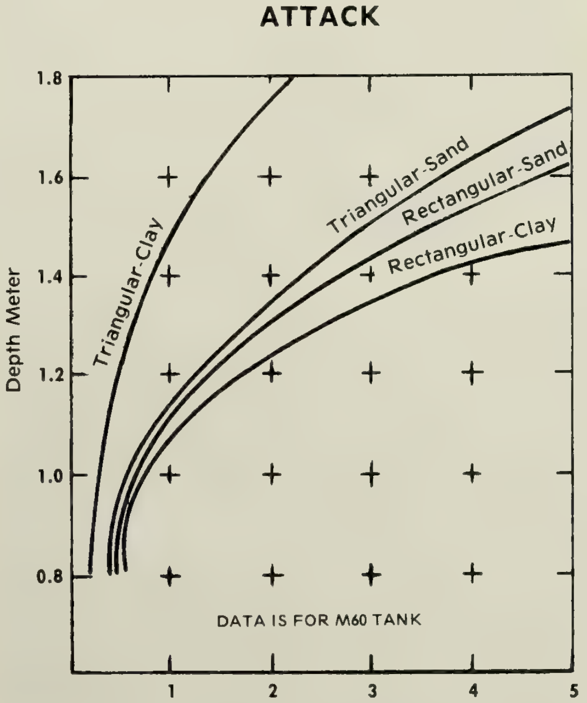
An obstacle system can provide that all important time factor to the defender. As opposed to the traditional minefield, however, the anti-tank ditch is particularly attractive in one important aspect. The defenders will be consumming an unprecedented large quantity of ammunition, placing a crushing burden on his transportation resources. A ditch barrier, unlike a minefield, imposed no additional haul requirement and is built with organic engineer earthmoving equipment.

The 94th Engineer Combat Battalion (Heavy) of Darmstadt, Germany, part of the 24th Engineer Group, recently completed a series of extensive field test to examine the employment of anti-tank ditches in the European tactical scenario. This test series, conducted during the period of April through October 1976, was called Operation Linebacker. The primary objectives of Operation Linebacker were to answer the following questions:

- How effective are anti-tank ditches?
- How should anti-tank ditches be utilized?
- What are the best construction techniques and how fast can we build them?

Field trials were conducted in sandy and cohesive soils, and were supported by several U.S. armor units. Over 100 individual vehicle crossings were observed and many kilometers of anti-tank ditches were constructed. The last, climactic trials saw two earthmoving platoons work continuously for 44 straight hours under simulated combat conditions. A portion of the constructed barrier was then subjected to an attack by a U.S tank company. The test results, especially tank-ditch production figures, were impressive and surprising.

Although the various field manuals are pretty cut and dried as to the dimensions of an anti-tank ditch, they are not explicit as to the expected results; that is how much delay can be expected from the barrier. To determine this, the test examined two basic shapes of ditch, rectangular and triangular (Fig 2), two different types of soil (sandy & clay), and produced a relationship between these variables, depth of ditch and delay times. Since actual Soviet built tanks were not available to us for testing, we subjectively concluded that the Soviet T-62 tank is *at least* as vulnerable to anti-tank ditches as the U.S M-60 tank for the following reasons: The T-62 is lower than the M-60, therefore more vulnerable to a vertical barrier; and Soviet tanks have a *manual* clutch and 5-speed transmission which make them less agile in a tank ditch than the M-60 with its automatic torque converter. We therefore felt comfortable in using the M-60 tank as a test vehicle.

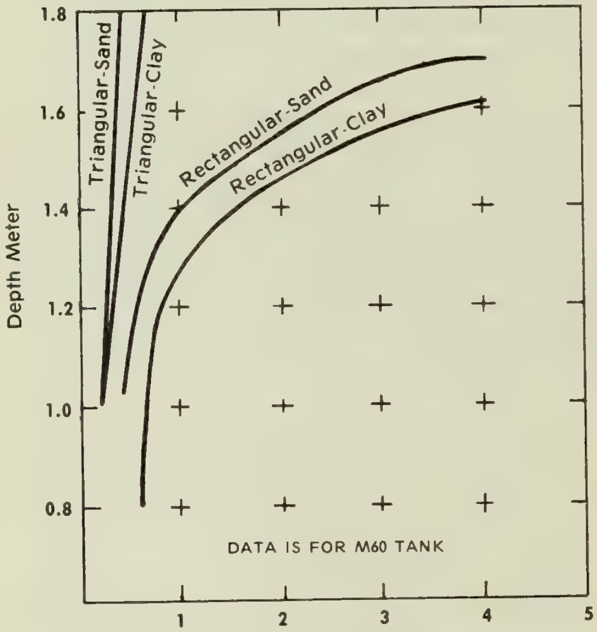


Time in minutes for a tank to attack across a ditch of varying depth.

FIGURE 3

Our first surprise was to discover that a very modest ditch caused significant delays. The data on delay times, which are for the M-60 tank, are summarized on Figures 3 & 4. Figure 3 shows delay for a tank attacking *toward* the defender's side of the ditch, while Figure 4 shows delay for a tank counter-attacking *from* the defender's side. Note that, while the rectangular ditch imposes a significant barrier to both attacker and counter-attacker, the triangular ditch caused little delay to the counterattacker—a significant point to the defender.

COUNTERATTACK



Time in minutes for a tank to counterattack across a ditch of varying depth

Using this data, the depth can be chosen to balance the commander's desires for delay time and the earthmoving effort available. A delay of as little as *2 minutes* can be tactically significant and can be achieved with a modest ditch of about 1.2m deep. From the photos one can see that the crew of the crossing vehicle cannot effectively fire its weapons, and the vehicle exposes its thin roof and belly armor numerous times during a crossing operation. We were surprised at how vulnerable a tank is when crossing a ditch. Since a well trained tank crew can get off several well aimed rounds per minute, one can see that the odds are beginning to even.

The width of the ditch is also important. First, a ditch must not be too narrow or a tank may bridge or jump the gap. (An interesting sidelight here—some tank commanders claimed that their vehicles could "jump" the ditch, but no one volunteered to try.) On the other hand, if the ditch is too wide, it may afford the tank a convenient hull-down fighting position. A width of 3.5 meters (width of a dozer blade) was chosen as a good compromise. The tanks can neither hide in it nor jump over it.

The size and position of the spoil berm are also important. The berm should be high enough to add to the obstacle value of the ditch but not high enough to provide cover and concealment for the approaching tanks. We recommend 1.0 meter as the height of the berm. (Editors Note: FM 5-34, Sep 76, shows the spoil of a triangular ditch on the enemy side. Here they chose to use the spoil as a part of the obstacle.)

CONSTRUCTION TECHNIQUE DOZER TEAM

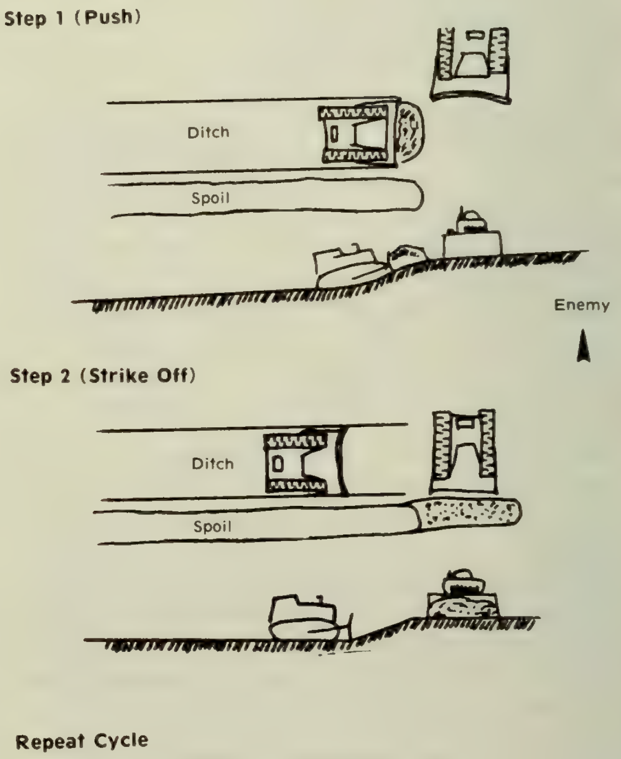


FIGURE 5

The demonstrated production capability was also a surprise. First, we found that dozers were more cost effective than scrapers. Using slot dozing techniques (Fig 5), two dozers or a dozer-scoop loader combination can produce about as much ditch as three scrapers and a push tractor, (Fig 6 shows recommended scraper technques).

SCRAPER TEAM

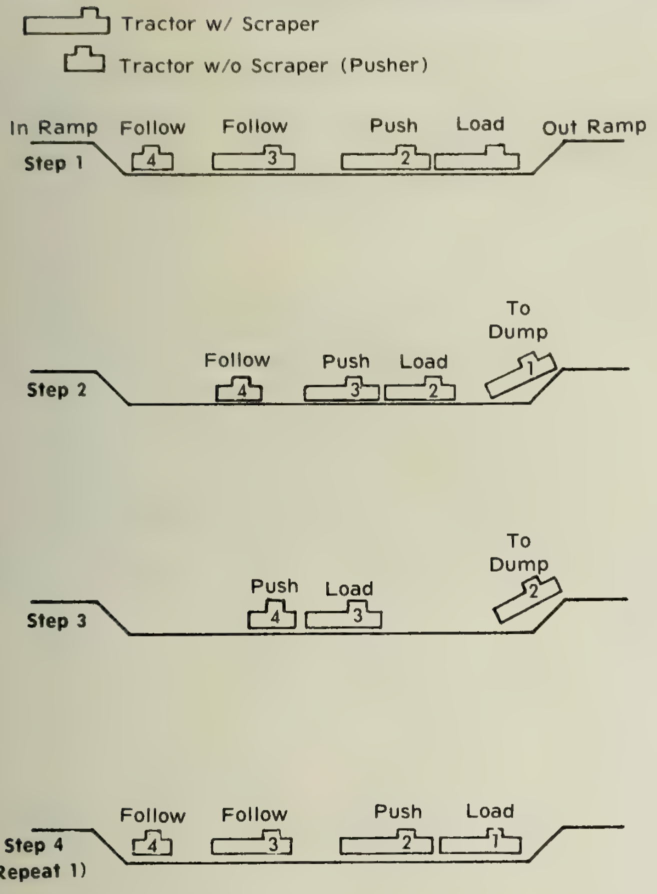


FIGURE 6

ANTI-TANK DITCH PRODUCTION CAPABILITY BY TYPE EQUIPMENT

TYPE EQUIPMENT TEAM	(Rhein Valley)	COHESIVE SOIL (CLAY) (Northern Hesse)
SCRAPER TEAM (3-290 Scrapers, 1-290 Pusher)	100 METERS/HR	125 METERS/HR
DOZER/LOADER TEAM (2 Dozers or 1-Dozer & 1-Scoop Loader	100 METERS/HR	80 METERS/HR

NOTES: Based upon depth 1.2 to 1.5 meters below natural ground level, width 3.5 meters. (Graders may assist in shaping ditch and berm, but are not essential)

FIGURE 7

The production rates for various equipment teams in two types of soil are shown on Fig 7. Using all the combat heavy battalion's earthmoving assets (Fig 8), the battalion can produce a surprising 15-20 kilometers of anti-tank ditch per day, reduced of course by relocation times to new ditch sites.

ENGR CBT BN (HVY)

EARTHMOVING ASSETS	
D-7 DOZERS	13 EA.
SCOOP LOADERS, 2½ CY	7 EA.
SCOOP LOADERS, 5 CY	2 EA.
290 TRACTOR W/O SCRAPER	9 EA.
290 TRACTOR W/SCRAPER	9 EA.
GRADERS	9 EA.

FIGURE 8

The European Scenario has many variations—each tactical commander has his own ideas. Your imagination can probably produce many scenarios and ideas in which anti-tank ditches can be used. Such as how can the ditches be used in the reverse slope, from ambush, with scattered mines, in defiles? What is the best mix of defending weapons to engage targets in the ditch and follow-on targets? These ideas are virtually limitless (and the subject of another article).

The most basic scenario grips our imagination, however, as we again return to our discussion of evening the odds. Visualize the first armored wave hitting an extensive anti-tank ditch system.

Siting the ditch properly has put the enemy targets between the effective killing range of the defenders, and the best firing range of the attackers. While the first wave is negotiating the ditch under heavy fire for 2 minutes, 5 minutes, or more, the follow-on waves, moving at 200-300 meters per minute, begin to stack up, slow down or stop, becoming vulnerable to your long range fires. Attacking tanks equipped with mine plows or rollers *cannot* cross the ditch, making the attacking force more vulnerable to mines. The enemy's use of bridging equipment or engineer vehicles to breach the barrier takes *time* and canalizes his forces. The speed and rhythm of his attacking formation has been disrupted, the effectiveness of his weapons are diminished, while the effectiveness of our weapons have been greatly enhanced. The defending commander has created the *time* he needed to acquire and destroy the enemy tanks.

The Odds Have Been Evened!!

The Engineers, with their earthmoving effort, are all over the Corps & Army areas, and they produce many *kilometers* of tank ditch!! This is not well known outside the engineer community. With aggressive, early coordination and planning by all members of the combined arms team, the engineers can assist in one more way to win that all important *First Battle.*

TACTICAL PROBLEM

SITUATION

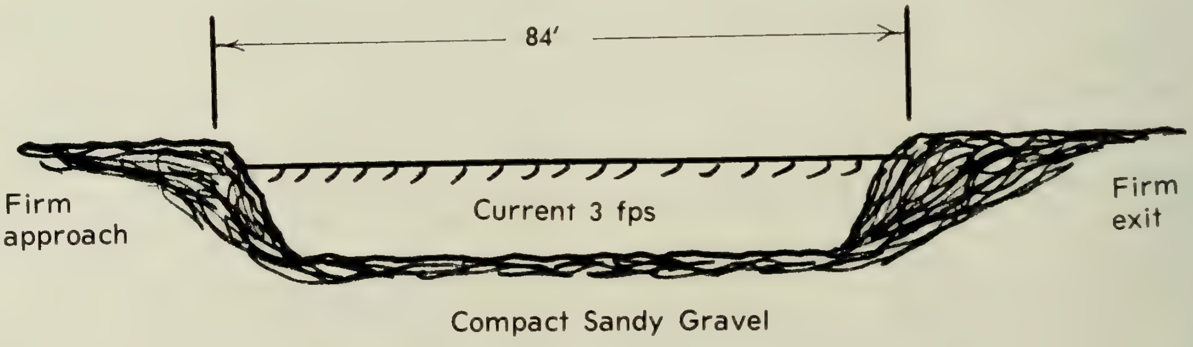
You are an Engineer platoon leader in an Armored Engineer Battalion in support of an advancing armored battalion task force. The leading tank platoon has been halted by the Red Run River which it finds impossible to ford. The task force commander has ordered you forward to recon a crossing site over the river.

PROBLEM

Your reconnaissance has revealed a possible crossing site where the M4T6 fixed span could be employed. This equipment is available to you. The 84 ft river width is too wide for the AVLB. The river is approximately 10 ft deep with 3 ft high banks and the current is 3 ft per second. The unprepared banks are compact sandy gravel as is the river bottom.

Design an M4T6 fixed span capable of getting the task force across.

1



SOLUTION

Design the bridge to take C/L 55 traffic.

STEP 1

A minimum of 3 ft of bearing is required for the bridge on each bank. The minimum bridge length is therefore 84 ft + 6 ft = 90 ft.

STEP 2

Maximum unsupported span for M4T6 is 45 ft. Try one C/L 60 trestle arrangement at the center of the bridge.

Trestle arrangement provides 15 ft of bridge deck. Remaining bridge length is 90 ft - 15 ft = 75 ft.

Continued On Page 39

TRAINING NOTES

ENGINEER ARTEP STATUS AVAILABILITY

The Engineer School has developed a series of informal pamphlets to help junior leaders in training squad and platoon level ARTEP tasks emphasizing team or unit training. The pamphlets are designed for easy reading and provide step-by-step, easy-to-follow guidance on how to train specific tasks listed in the ARTEP.

As the program is relatively new, there are only a few pamphlets available, however, more are on the drawing board. Available pamphlets are listed on page 101 of the USAES Instruction Material Catalog (USAES Pam 310-1) along with instructions on how to order them. The following are currently available:

ARTEP TASK NUMBER	TITLE
4-13	Secure a Worksite
4-14	Recon Patrol
5-15	Route Recon
6-17	Crater Roads
8-8	Layout a Bailey Bridge
9-2	River Recon
5-19	Bridge Recon
6-14	Prepare a Target Folder
4-17	React to Enemy Contact

In Production:

7-3	Breach Obstacle with Explosives
6-16	Disable a Bridge

If your unit does not have a catalog, write to:

Director
Extension Training Management Division
Directorate of Training, USAES
Fort Belvoir, VA 22060

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TASK TRAINING PAMPHLETS OFFERED BY ENGINEER SCHOOL

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5-500	Engineer Cellular Tms	Draft	4/78	Proposed Date
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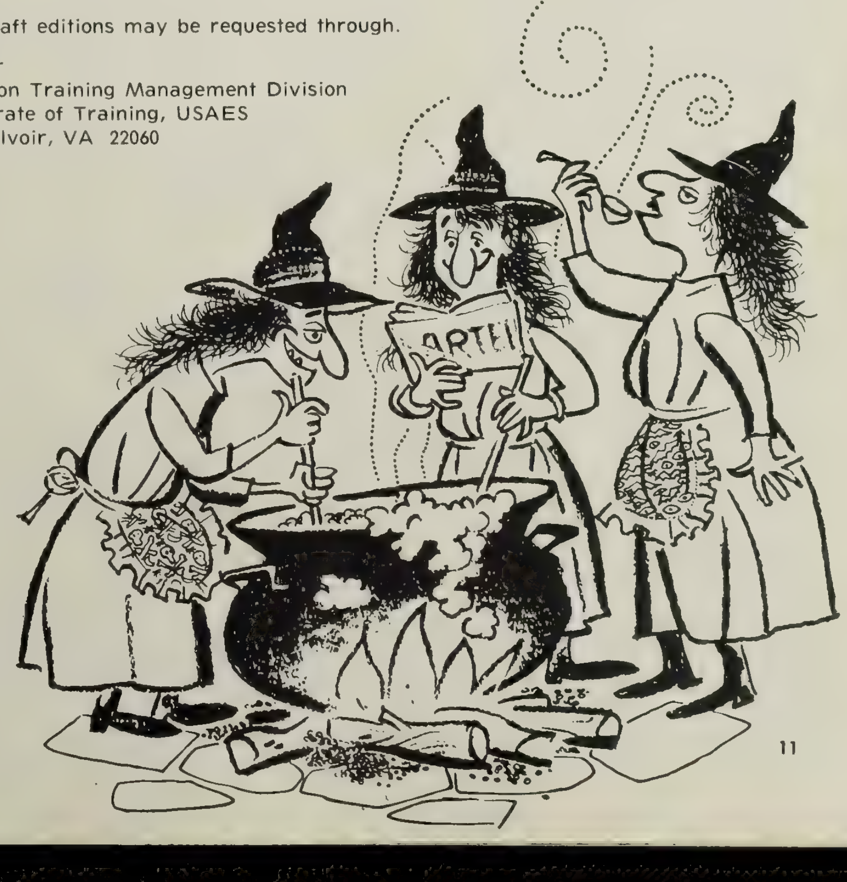


AN AIR STRIP FOR YFC

CPT Michael P. McCann

On August 5, 1976 at Yakima Firing Center, Washington, the new Selah Creek Airstrip was formally dedicated. The first C-130 successfully touched down at 1330 hours commmencing the estimated 2,000 cycle life of the airstrip.

The idea of constructing an airstrip at Yakima Firing Center (YFC) was originated by the 2nd Battalion (Ranger) 75th Infantry, located at Fort Lewis, Washington, to accomodate C-130 aircraft while supporting the Ranger Battalion in their deployment exercises to YFC. The original request was for a forward area airstrip with a 4,000 foot main runway and a taxiway.

The 864th Engineer Battalion (Combat) (Heavy) was assigned the task to evaluate the construction of a new landing strip as compared to upgrading an existing strip or using a commercial facility. Since there was no commercial facility on or adjacent to Yakima Firing Center, the latter alternative was discarded early in the planning.

Numerous sites within the boundaries of YFC were examined with the most feasible site being on an old assault landing strip. Originally built in 1952, this airstrip was used to train C-119 aircraft pilots in preparation for their deployment to the Korean theater of operations.

Consisting of a 3200 foot runway and a taxiway of similar length forming a "V", this old strip had been developed by merely clearing the vegetation and leveling the runway. Some rock had been placed on portions of the runway, but test showed the bearing capacity to be California Bearing Ratio (CBR) 14, much below the CBR 80 required to support C-130 aircraft.

In October, 1975, the 864th Engineer Battalion completed its engineering study and made three major recommendations on the configuration of the Selah Creek Airstrip. The first was to extend the runway an additional 1000 feet to a total length of 4200 feet.

Second, it was recommended that the surface be of asphalt concrete with an adequate crushed rock subbase. It was recognized that although this design would not be a true "forward area" airstrip, high maintenance costs could be avoided by improving the quality of the surface. Third, in order for the airstrip to be used by Air Force C-130 aircraft, it was recommended that a request be sent to the Federal Aviation Administration (FAA) for a waiver on a nineteen foot high land mass that extended into the approach zone prism. Removal of the landmass by excavation was impractical due to excessive costs.

It was estimated that, by using a combination of asphaltic surfaces which would provide an estimated 2,000 aircraft landing cycles before extensive maintenance, the total project cost would be $65,361. This combination of surfaces consisted of 3 1/2 inches of new crushed rock and 2 1/2 inches of asphalt concrete in the touchdown and turn areas, 41/2 inches of new crushed rock and double surface treatment on the taxiways, and 31/2 inches of new crushed rock and 21/2 inches of road mix on all runway areas other than those mentioned above. Although this design was somewhat less than a full Class II surface, it was considered adequate for this mission. Class II surface, according to AF-TAC maual 88-1, "Design Manual for C-130 Landing Zones for Training Bases in CONUS", dated 1970, is a runway that will withstand 2000 cycles over a four to six month period of time before major repair is required. It was concluded that in supporting the traffic of the Ranger Battalion, Fort Lewis Emergency Deployment Readinesss Exercises (EDRE's) and major field maneuvers such as Brave Shield XIV, the Airstrip would not experience concentrated use and could be expected to last four to five years.

In order to provide an emergency capability for the Ranger Battalion and Fort Lewis EDRE's to utilize the airstrip at the earliest practical time, it was decided to perform the neglected maintenace of the existing strip in order to provide an emergency landing capability within the YFC. Maintenance work on the existing strip was designed to provide a rough forward area landing strip by mid-December 1975. Four inches of compacted, treated crushed rock were emplaced to sustain ten to fifty C-130 sorties before extensive maintenance would be required. Great care was taken during this maintenance work to insure that none of the "new work" features, such as runway extension, bypass road construction or asphalt surfacing were undertaken. All effort was concentrated on returning the existing strip to a useable condition.

Approximately 90 personnel from the 864th Engineer Battalion participated in the maintenance of the airfield to include the quarry section, one horizontal construction platoon, and a portion of the Direct Support Maintenance Section. In May 1976, the asphalt section, an additional Horizontal Construction Platoon, and a task for commander with a small operations staff were added bringing the total personnel strength to 160.

On October 31, 1976, the Director of Facilities Engineers (DFAE), Fort Lewis, ordered the 864th Engineer Battalion to commence maintenance operations on the existing strip. By late November, the maintenance work, which was estimated to take 45 days, was 62% complete, but not without problems.

As anticipated, the rock crusher and quarry equipment experienced frequent breakdowns. Fortunately, repair parts were readily available within a two to four day time frame, but only by means of local purchase.

Proper compaction of the crushed rock required a vibratory compactor which the battalion did not have in its inventory at the time. The 62nd Engineer detachment at McChord Air Force Base was contacted for a vibratory compactor, but their equipment did not prove suitable. Next, two vibratory compactors were located at the 819th Construction Engineer Squadron (Red Horse) at McConnell Air Force Base, Kansas. However, this was ruled out due to the shipping costs. Rental of the compactors through a local Yakima vendor was not possible as funds were not available.

Finally, a suitable vibratory compactor was borrowed from the Reserve Naval Mobile Construction Battalion (Seabee) NO. 18 at Sand Point Naval Air Station, Seattle and it remained on site through the duration of the airstrip maintenance.

As the weather and soil conditions became

unsuitable for further construction work in mid December, maintenance was halted at 67% complete. The remainder would be finished the following spring.

Although no maintenance was accomplished for four months, the crusher continued to operate as weather permitted. Moreover, the FAA approved the waiver of the approach zone requirements and the Air Force approval of the final design recommendations came through in mid-March of 1976.

The formal request for funding for new construction was submitted by DFAE to the Department of the Army (DA) in March 1976. Although the original cost estimate had approximated $65,000, a turnaround, parking apron and 400 extra feet of main runway were added to make the airstrip more efficient and enable simultaneous loading and unloading of six C-130 aircraft.

Consequently, the request for funding approval submitted was in the amount of $83,000.

In late April 1976, DA informed Fort Lewis that it was modifying the design and on May 21, 1976 the new construction was authorized to commence on May 20, 1976 at a funded level of $189,258. Unfunded costs were estimated at $48,907 for a grand total of $238,165 (unfunded costs include equipment depreciation and troop labor).

On May 28, 1976, the 864th Engineer Battalion was tasked to initiate construction of the Selah Creek Airstrip project. By early May, the weather inYakima had improved sufficiently allowing for the resumption of maintenance. When the new construction work was authorized, 80% of the originally defined maintenance work had been accomplished.

Also in the Spring of 1976, the battalion received a major portion of the remaining pieces of

equipment contained in the new Commercial Construction Equipment (CCE) Package. This proved to be an invaluable asset in the completion of the airstrip. Included were 20 ton dump trucks, backhoes, nine to 14 ton steel wheel rollers, vibratory compactors and smooth wheel rollers. The D-8 bulldozers, 40 ton trailers and five yard scoop loaders, were received in the Spring of 1975.

In June 1976, a construction deadline of August 1, 1976 was established. As the airstrip was to be used during Joint Readiness Exercise "Brave Shield XIV". Since the 864th Engineer Battalion does not have organic hot mix asphalt pavers, the portions of the pavement to be hot-mix asphalt were to be performed by the 659th Engineer Company (Reserve) during June 12 thru 26, 1976, the only time frame the unit could be made available. To insure the subgrade would be prepared for paving by June 12, the preparation of the base course, installation of culverts, and procurement of asphalt and related materials became of prime importance.

To insure a quality subgrade, soils consultants were called in from the Portland and Seattle Engineer Districts to inspect the project. Each concurred in the use and method of compaction of the pit run rock, consisting mainly of five inch minus material used as the base course. Similarly, they concurred in the use of one inch minus material as a leveling course over the entire strip and 1 1/2 inch material to cap the shoulder and clear areas. However, due to the low winter temperatures in the Yakima area, it was pointed out that a critical factor was to insure that the material under the traffic area was not frost susceptible. They also recommended that the use of water trucks be maximized to obtain the optimum moisture content during compaction.

The second critical item in preparing the airstrip foundation was the installation of 450 feet of 18 inch concrete culvert. One section, approximately 300 feet in length was placed under the northwest turnaround, and the other section was placed under the main runway.

The culvert mateials were obtained thru local purchase.

The contract for the asphalt and prime cost was awarded one week prior to the commencement of the paving operations. Any contract or construction delay beyond June 12 would have left the reserve unit with little or no valuable training. However, both the subgrade and the asphalt were prepared on time and the 659th Engineer Company placed over 4300 tons of hot mix asphalt.

An agreement was made with this company for the 864th Engineer Battalion to borrow the USAR paving equipment for the duration of the project, assuring continuity. After an on site inspection by the asphalt contractor and the 864th Engineer Battalion, a recommendation was made to substitute hot mix asphalt for the road mix (originally planned for the runway) for reasons of availability, strength, durability, and curing time. Moreover, after investigating the cost of installing the pugmill stipulated by DA for on site mixing of the road mix asphalt, it was found to cost $57,000 instead of the budgeted $9,000. However, the estimated cost of a two inch hot mix to replace the road mix added only $5,120 to the project cost and provided a better surface. For theses reasons, the hot mix was approved to replace the road mix.

A request for additional funds to purchase the additional hot mix asphalt and was forwarded to DA on July 9, 1976 and approval was received on July 15, raising the total cost to $199,758.

By 25 June the new work was 42% complete with the long and short taxiways and the south touchdown area paved with 4,378 tons of asphalt.

On 16 July the new work was 66% complete with the remaining areas of the runway and long and short taxiways scheduled for paving from July 19 thru 23. By 27 July, 9,040 tons of asphalt 11,943 cubic yards of 1 1/2 inch minus and 10,320 cubic yards of one inch minus rock had been emplaced. As of 3 Dec 76 the project was operational and 84% complete. Construction of the parking apron was deferred until the spring of 1977 pending investigation of possible money saving design changes.

The normal method used by the U.S. Army to compare military to civilian costs is to use AR 415-17. This regulation is based on statistics from actual bid experience and sets forth definite procedures to be followed for a budgetary office to estimate the cost of a construction project that is to be built by a private contractor and supervised by the Corps of Engineers. The computed cost estimate is used to judge the bids on private contractors as well as to serve as a basis for requesting necessary funds for the project. The data in this regulation is the basis for the following cost figures (parking apron not included):

2½ inch asphalt	$ 147,300.00
2 inch asphalt	129,570.46
Rough grading	96,269.34
Fine grading	36,310.22
Borrow	353,345.17
Excavation	99,848.20
Leveling Course	277,918.39
Base Course	833,755.18
Piping Installation	14,898.09
Concrete headwalls	1,239.15
	$1,990,454.20

Actual costs of the project, as performed by the 864th Engineer Battalion, both funded and unfunded, are shown below as of 10 August 1976:

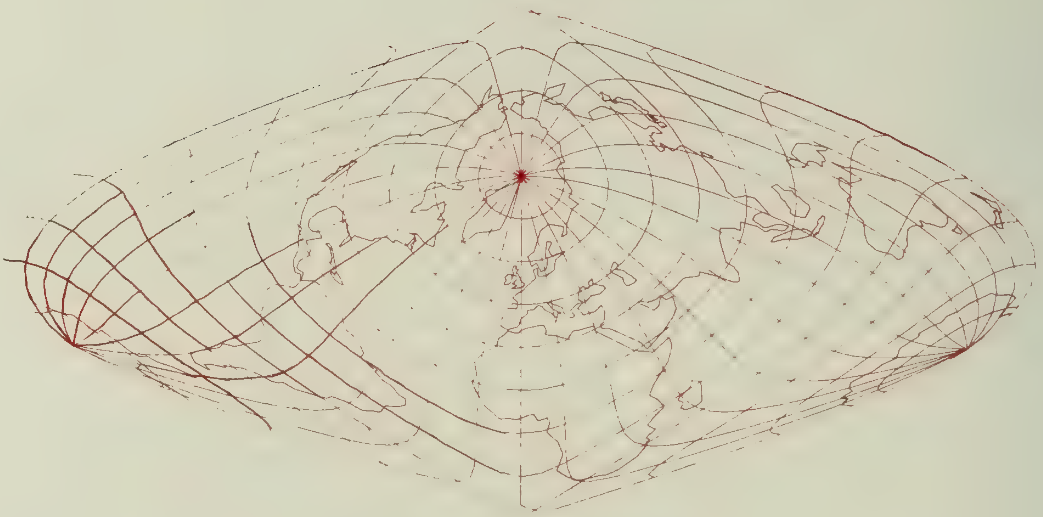
RC-70	$ 14,537.50
Hot mix	126,568.40
Culvert	2,514.40
Equip Op and Maint	24,358.84
PVC Pipe	623.86
Survey Stakes	132.50
Rakes	144.58
Concrete	245.00
Crushed Rock (Quarry)	10,842.00
	$179,966.68
Unfunded costs	46,449.64
Total cost	$226,416.32

Comparison of the estimated civilian construction cost to date ($1,990,454.20) with the cost to date of military construction ($226,416.32) reveals that the cost of having this airstrip constructed by military personnel was approximately 11 percent of what the funded cost would have been had the project been constructed by a private contractor and supervised by the Corps of Engineers. The total money saved was approximately $1,764,000.

The cost savings must be re-emphasized, and considered as a very valuable asset. An additional value on which a price tag cannot be placed, was the training opportunity afforded the men of the 864th Engineer Battalion and the fact that they can take pride in saying "I helped build that!" The lessons and skills learned will be of untold benefit in the future. This project is a prime example of what military engineers are capable of accomplishing *when given the opportunity.*

A 1970 graduate of the University of Washington ROTC program with a Bachelors in Civil Engineering, Captain McCann is now the Pipeline Engineer for the 864th Engineer Battalion at Fort Lewis, WA. After attending the Basic Course, he was assigned to the 15th Engineer Battalion at Fort Lewis, where he served as a platoon leader, Assistant S-4, ADE Liason Officer and the Battalion EEMO. Later he served as the EEMO and then the Pipeline Engineer for the 864th Engineers.

An Automated C



Ellen K.Cramer

Automation of a work area that for centuries has been done by hand, brings with it many new problems to be solved. When applied to the field of cartograpy one of the first questions that arises is WHO will be capable of bringing about such a transformation?

Engineer Topographic Laboratories (ETL) is responsible for getting an automated cartographic system off the ground. The people who are doing it are basically engineers who have learned computer programming. They have mixed the engineering and computer sciences to significantly impact the mapmaking process. They define cartography as the drafting process used to symbolize and prepare color separations required for reproduction. This is the step that normally takes place between photogrammetric compilation and printing.

Inputs to the cartographic process are line work, orthophotographs, and digital data. The outputs are varied also, including materials for reproducing line maps and orthophotomaps, as well as digital data as an end product in itself. Although maps are produced at a variety of scales, the largest number are printed at 1:250,000 or larger scales.

At present, ETL is developing prototype automated cartographic equipment and computer software to control the hardware which will be used in actual cartographic production centers. The prototypes are expected to provide the basis for future production equipment.

The basic ETL approach toward automation of the cartographic drafting function involves digitizing linear data, manipulating this data into a computer to generate map symbols and using an automatic plotter (i.e., drafting machine) to produce cartographic color separations. Under this approach the human judgement necessary for proper interpretation and evaluation of basic data is retained with the system up to the digitizing phase. The task of the computer-plotter portions

rtographic System

of the system is to convert the digitized manuscript data to a standard symbolized from which relieves the draftsman of the tedious, repetitive task of symbol drafting. Also, the digital data produced can be retained for furture use, manipulated mathematically to produce maps at other projections or scales, and in certain cases used as an end product in itself by those map users requiring map data in digital form for computer analysis.

The heart of a cartographic system based on this approach is a general purpose digita computer. ETL's primary concern is development of hardware through which to input data to the computer, hardware for drafting or plotting the computer output, and software necessary for efficient operation of the central computer.

There is some question as to just what one can reasonably expect the computer to do. Certainly we intend the computer to reformat data from a digitizer into plotter-output form. This includes calling up subroutines to enable the plotter to draw various standard sysbols automatically. (This is the basis of the whole approach.) But how much cartographic license (i.e., judgement) is a computer capable of exercising? At present, one expects very little from the computer in this regard. ETL engineers use a cathode ray tube (CRT) display device to enable the map editor to inspect the digitized data and make corrections or revisions as needed. This is not an ideal approach because cathode ray tube displays do not have the resolution size or precision that one would like to have. It is a reasonable approach, however, within the current state-of-the-art, and the possibility of using color CRTs for editing is just over the horizon. As computers, and knowledge of their use become more sophisticated, one can, no doubt, ask the computer to do such tasks as generalization of data with reasonable expectation of success. This would facilitate changing map scales in the computer and preparing different products from the same basic data.

Some of the equipment developed to date is:

- The Digital Planimetric Compiler (DPC) which consists of five standard Bendix Datagrid digitizers interfaced to a PDP-11 minicomputer and magnetic tape unit.
- A compute-controlled CRT head for use on a Gerber Plotter, Model 1232. Designed for very high-quality plotting of digital cartographic data.
- The Electron Beam Recorder which is currently being developed by ETL for: (a) producing miniature map color separations in a form suitable for data base applications, (b) immediate use in reducing the costs of automatically plotting cartographic data onto film (c) producing black and white photographs from digital data.
- Digital Input/Output Display Equipment (DIODE) which will provide an interactive editing capability in the Automated Cartography System.
- The Cartographic Scanner/Plotter, an off-line device that combines the functions of scanning scanning cartographic manuscripts and plotting cartographic color-separation negatives or positives.

How will this automation affect the map user? We hope that he will be supplied with maps that are more up-to-date and available in greater variety. The production of unique and new products will become cost effective and as labor costs continue to increase, automation will become vital from a monetary or budget standpoint.

The intent in this first article is to give an overview of the work being done in the Automated Cartography Branch. Ensuing articles will contain more detailed reports on each of the pieces of equipment being developed.

Pioneers at Normandy Beach

Norm Covert

"During the operation," Patton wrote, "the engineers performed magnificently . . . At Thionville, we saw the longest Bailey Bridge in the world. It had just been completed . . . under fire."

One of the engineers' finest hours was in establishment of the Normandy Beachhead in June 1944. In discussing the problems plaguing the troops on Omaha Beach, General Omar N. Bradley commented, "Much of the difficulty has been caused by the underwater obstacles. Not only had the demolition teams suffered paralyzing casualties, but much of their equipment had been swept away."

The following article outlines some of the accomplishments of those brave engineers. Among the units described, the 1st Infantry Division is stationed at Fort Riley, KS, the 4th Infantry Division is at Fort Carson, CO, and the 237th Engineer Battalion (Combat) is in the Federal Republic of Germany. The 29th Infantry Division was deactivated in 1968.

The 237th, which performed brilliantly at Normandy and throughout the drive into Germany, was disbanded after the war. Reactivated in January 1955, the 237th became a part of VII Corps, US Army Europe, and is homebased in the Neckar Valley at Heilbronn.

Among the personalities, First Sergeant M.R. Johnson went on to receive a direct commission during the Korean Conflict and retired in 1966 as a lieutenant colonel. He is a civilian employee of the U.S Army Training and Doctrine Command, Fort Monroe, VA.

Virginia-born Ray Johnson was only 19 years old but he wore the chevrons of a company first sergeant like a veteran. His promotion up the ranks had been fast during the Army buildup period. He had learned a lot and had been a good teacher. This day he'd earn those stripes.

He braced himself against the gunwales of the LST and tried to ignore members of his combat engineer company, most of whom were violently seasick. The English Channel off the coast of France was a torrent and the large landing craft bobbed uncontrollably.

Johnson wasn't seasick, but he felt queasy inside. Really loose. Plainly Johnson was scared, but so was every other man on the Normandy Coast that day in June 1944. The invasion was on. It was D-Day.

The LST was crammed with equipment and men. Johnson and elements of his unit (detached from the 84th Infantry Division) has boarded the craft at Liverpool, England, two nights before and had ridden out a heavy storm.

Now laying off the Normandy Coast, Johnson looked through his field glasses and strained to see the beach ahead. The sky was raining Naval gun fire, artillery and small arms fire.

As far as the eye could see were ships and boats of every size and description. Men in full battle dress clutched their weapons and dashed along the beach seeking a hiding place. Heavy equipment, small landing craft and light amphibious vehicles lay partly submerged in the surf, jerking against the shore as the tide rolled.

Johnson had watched stupified as the 2d Ranger Battalion under the command of Colonel William O. Darby scaled the cliffs of Pointe du Hoe in the face of enemy hand grenades dropped from the bluff. He had been a front row spectator as elements of the 29th, 4th and 1st Infantry Dvisions scrambled for a toehold on Omaha Beach. It was altogether unreal.

Johnson saw wave after wave of men hit the beach, saw many tumble under the onslaught of enemy fire. He saw demolition teams attempt to clear the beach of obstacles. He wanted to go back to England.

The engineers under Johnson were assigned to land at the Utah Beach, secure their area, complete removal of obstacles and construct roads inland for the movement of troops and supplies.

Other elements assigned to the Beach Obstacle Task Force had circled the rough water through the early morning mist for some seven hours. Ready to follow the first wave of Infantrymen ashore, those Pioneers and Navy Frogmen were scared, too.

The Beach was a deadly obstacle course. It's defensive fortifications had been planned and executed by Field Marshal Erwin Rommel, the notorious Desert Fox.

In a top secret document to his staff, Adolph Hitler said in November 1943 an attack could come anywhere along the coast. ". . . Only an all-out effort that will enlist all available manpower and physical resources of Germany and the occupied

areas, will be able to strengthen our defense along the coasts within the short time that still appears to be left to us."

Rommel figured the battle for the Western Front would be decided at the water's edge. An elaborate scheme of strong points was erected. A variety of concrete pillboxes providing terrifying and effective fire along the beaches were set up. In addition, beach obstacles included concrete dragon's teeth, Belgian Gates, tetrahedra and land mines.

Allied planners of Overlord, code name for the invasion of Europe, were fully aware of defensive measures at Normandy. Army Combat Engineers and Navy demolition teams were assigned to the Beach Obstacle Task Force. Their job was to clear the beaches.

At H-Hour, 0630 on June 6, troops of the 29th and 1st Infantry Divisions landed on Omaha Beach in the face of withering fire. They could do little more than find protection from enemy guns. Demolition teams landed moments later—their numbers chopped off by defensive fire.

Engineer equipment—that which didn't sink between mother ship and shore—was tangled in obstacles and disabled on the beach.

Back in England, the demolition teams had practiced on models of the defensive obstacles and through trial and error learned to neutralize them in about 30 minutes. On the beach in Normandy it was a different story. There has been no defensive fire in England.

By noon six paths were opened by Engineers, not nearly enough to break loose effective fighting teams. One young lieutenant, coordinating the clearance operation in one sector of Omaha Beach, manned a bulldozer when two previous drivers has been felled by gunfire.

As elements of the 8th Infantry Regiment, 4th Infantry Division, neared the beach, it was quickly ascertained they would land about 2,000 yards south of their intended landing zone. This had been caused by small landing craft drifting off in the wind and choppy waters of the Channel, plus the inexperience of many coxswains.

The misdirected landing proved to be a boon.

By hitting the beach so far south, the troops landed out of the primary fire zone of German defenders. The beachhead was established quicker than expected.

Members of the Beach Obstacle Task Force, who landed moments later, found themselves jammed up with troops and Naval Demolition Teams. Under the command of Major Herschel E. Lynn of the 1106th Engineer Combat Group, the task force was to clear four 50-yard gaps through beach obstacles to the high water mark. The Force included Army Combat Engineers of the 237th Engineer Combat Battalion, eight tank dozers from the 612th Light Equipment Company and 70th Tank Battalion.

Problems with landing craft caused both Army and Navy demolition teams to land almost simultaneously and the four reserve engineer teams beached nearby. Teams aboard two LCTs (Landing Craft Tanks) and one LCM (Landing Craft Mechanized) had to wade ashore in three feet of water after the crafts were sunk by shell fire. Each man carried 60 pounds of explosives and teams set about preparing the seaward band of obstacles. With both enemy fire and friendly fire blending into deadly confusion, engineers continued to work, finally blowing the first gap. The landing crafts made a beeline for the cleared area, causing dangerous congestion.

Adding to the debris were dozens of beached landing craft including the engineers' own M-29 Weasels, an amphibious tracked vehicle. In fact, MAJ Linn and MAJ R. P. Tabb, executive officer of the 237th Engineer Combat Battalion, both lost their Weasels in the surf. MAJ Tabb managed to save his crew and a radio and dashed for the beach where he got in touch with Brigadier General Theodore Roosevelt who was running up and down the beach trying to organize the confused 8th Infantry troops.

With all demolition teams on the beach, it was decided to set simultaneous charges on the three lines of obstacles. The tremendous roar of the medium powder charges ripping through three belts of concrete, metal and wooden obstacles was hardly noticeable.

Debris left by the explosions seemed as impenetrable as the obstacles had been. The limited number of tank dozers were pressed into service. Much of the mess would be cleared later by Johnson and his company.

Each assault company of the 8th Infantry was assigned a platoon of engineers which began blowing gaps in the sea wall and clearing paths inland through the dunes. Every tool in the engineer's arsenal was used on Utah Beach that fateful morning, including bangalore torpedoes, mine detectors, explosives and pioneer-tools and markers.

Not only did Company A of the 237th Engineers blow two gaps in the wall on Red Beach subsector, it demolished two Belgian Gates and picked up several prisoners from pillboxes along the wall. Simultaneously, Company C of the 237th ripped two gaps in the wall on nearby Green Beach.

Braving both friendly and enemy fire in the flat, sometimes boggy countryside, the engineer teams moved inland, blazing roads and removing mines. Shortly after noon, an enemy anti-tank gun covering a blown culvert on the primary exit, knocked out a tank after another had struck a mine. A third tank blasted the gun emplacement, MAJ Tabb then called up a platoon of engineers who built a small treadway bridge allowing the heavy traffic to move.

The coxswain aboard Johnson's heavily loaded LST finally received word to head for shore. Johnson and his men made a final equipment check as the beach neared. He still had butterflies in his stomach. The first order of business was survival.

The boat crunched to a halt and the giant jaws opened up in the bow. "Everybody out!" Johnson yelled.

He leaped into the shallow water and moved as fast as he could under the heavy combat load. It was every man for himself. Johnson had trouble keeping his footing in the flat rocks just inside the surf line, but kept going, his heart pounding and equipment beating him on the back. He found a shell hole and dove in. He hadn't noticed the crowded beach, nor other engineers laboring in spite of the war going on.

The young first sergeant quickly established the company operations base, supervised beach clearance and moved inland on D-Day plus 1.

There were a lot of rivers yet to be crossed.

Mr. Covert is assigned in the Command Information Branch, HQ TRADOC, Office, Chief of Public Affairs. An Army veteran, he served with the 237th Combat Engineer Battalion and 7th Engineer Brigade in Europe form 1967 to 1969. During his more than fifteen years in journalism, Mr. Covert was a news, sports and military affairs writer for the Newport New (Va.) Daily Press. He was editor of the US Army Recruiting and Career Counseling Journal prior to his assignment at TRADOC in July 1973.

OPERATION SNOW-GO TO THE RESCUE

SP4 Bob Small

"Gentlemen, you came to our city and fought aggressively to help us overcome this disaster. You gave of yourselves and proved to the world that the U.S. Army is a force 'for the people.' "As you leave the city of Buffalo the hearts and best wishes of its citizens go with you. On behalf of the citizens of Buffalo, I, Stanley M. Makowski as mayor, declare Feb. 8 as 'Brigade Day.'"

The mayor of the northern city made this declaration to the more than 300 Ft. Bragg, N.C., soldiers who participated in operation "Snow-Go." Their mission was simple—dig out the snowstorm-ravaged city of Buffalo which was experiencing the worst winter ever.

During January of this year snow fell on Buffalo every day leaving total accumulation of more than 60 inches of snow. An average temperature of 13 degrees for the month, added to the problems. As the blizzard continued, high winds blew over the city causing low temperatures and enormous snow drifts. The local street maintenance departments began losing the battle with mother nature. Eventually winter's grip on the city left many of its automobiles as well as citizens stranded.

Many cars soon became mere snow piles in the city streets. Drifts reached heights previously uncommon to the area. In the suburbs some drifts reached as high as telephone wires. One man was seen sitting on top of a traffic signal which normally would have been in the middle of an intersection.

It became impossible for any vehicles, emergency or otherwise, to make their way through the city. Citizens could not leave their homes to go anywhere. Many were even stranded at their places of business.

National Guard and U.S. Army Reserve troops were called in to assist in snow removal operations. But the snow kept falling and the situation became desperate.

Thomas R. Casey, of the Federal Disater Assistance Administration was appointed by President Jimmy Carter to coordinate efforts with

the state of New York in close evaluation of the situation, which worsened by the day, Casey called on active Army units to join the effort.

Mr. Casey contacted the First U.S. Army Disaster Control Element and requested assistance. First Army notified the U.S. Army Forces Command (FORCOM) of the request.

On the morning of Jan. 29, FORSCOM asked XVIII Airborne Corps and Ft. Bragg headquarters for a list of all engineer equipment available to assist in the snow removal operation. Within hours, the 20th Engineer Brigade (Combat) (Airborne) provided the list and placed the equipment and personnel in "ready" status.

Soldiers of the 20th Engineer Brigade's 27th and 548th Engineer Battalions and of the 1st Corps Support Command (COSCOM) began winterizing their vehicles.

In the early afternoon of Jan. 31, FORSCOM notified Ft. Bragg officials to deploy all available resources immediately. At that time, the Corps Emergency Operations Center was activated.

What was the troops' reaction? "I had calls from everyone from privates to sergeant major telling me they wanted to go to New York," said Second Lieutenant Debra L. Palmer, assistant adjutant at COSCOM's 46th General Support Group Headquarters. "When troops found out we were looking for Buffalo natives," she added, "some people tried to change their home of record so they could go."

Prior to departure the troops underwent preparations for overseas reassignment (POR). This process gave those deploying the opportunity to execute wills and powers of attorney if needed. Also, change of address cards were completed for the redirection of mail. Letters were sent to wives of members deploying, explaining how and where they could get assistance of any type during the spouses' absence. Finally, each departing member filled out a Hometown News Release Form so news releases could tell the folks "back home" where they were going and what they were doing.

After the troops completed this portion of POR they were issued cold weather gear. The equipment included wool fatigues, insulated underwear, snow glasses to cut glare, complete parkas, heavy mittens and insulated boots. The soldiers were also briefed on cold weather and details of the mission.

Equipment that was to make the trip received careful attention. Road graders, bucket loaders, dump trucks and wreckers were checked to insure the proper level of anti-freeze was maintained.

"I had equipment operators coming to me and begging to let their equipment make the trip," said Captain George J. Captain, assistant S-3 in the 27th Engr. Bn. "There was one guy who had a vehicle that couldn't pass inspection. He worked on that thing all night and finally moved out on the 35th flight. The equipment was lined up in convoy order and inspected by personnel from the 264th Engineer Company, also of the 20th Brigade, before departing for Pope Air Force Base's Green Ramp. Once at the Air Force Base the equipment was weighed and readied for flight. Air Force personnel from the 3d Aerial Port, Pope AFB assisted in preparing equipment and personnel for flight. They were responsible for getting equipment onto the aircraft and insuring that it was tied down securely while in transit.

Within 13 hours of the initial notification, an advance party of 32 soldiers was on its way by C-130 Hercules aircraft to Buffalo. This party was made up primarily of 20th Engr. Bde. staff members so that the forward operations center in the Buffalo area could be established as soon as possible. The main body of troops and equipment began departing Pope AFB seven hours later in 37 separate flights. Five Air Force C-5A Galaxies, 8 C-141 Starlifters and 24 C-130 aircraft carried the load. The C-5A aircraft flew to Pope from Dover Air Force Base, Dover, Del. to do the job. McGuire AFB N.J., and Charleston AFB, S.C., supplied the C-141 Starlifters.

By the evening of Feb. 4, 322 personnel and 68 pieces of equipment (750 tons) had been airlifted and were in Buffalo assisting in relief efforts.

The equipment included 13 bucket loaders, 12 road graders, 10 - 5-ton dump trucks, 8 - 1/4-ton trucks, 7 - 5/4-ton trucks, 5 - 2 1/2-ton cargo vehicles, 5 wreckers, 4 - 5/4-ton contact trucks, 2 - 49-ton fuel trucks, 1 - 12-ton tilt bed and 1 - 5/4-ton ambulance.

The troops and equipment were transported 740 miles from Ft. Bragg to Niagara International Airport. This airport is located 18 miles north of Buffalo and a few miles south of the U.S.-Canada border. As they arrived they convoyed to the city to begin work.

In addition to below-freezing temperatures, several factors contributed to the hazardous and uncomfortable working conditions for the soldiers. First, driving winds seemed to push snow back onto streets as fast as they were cleared. In addition, stranded automobiles cluttered the streets and made total clearing impossible.

To aid the clean-up effort Mayor Makowski imposed several traffic bans which prohibited all

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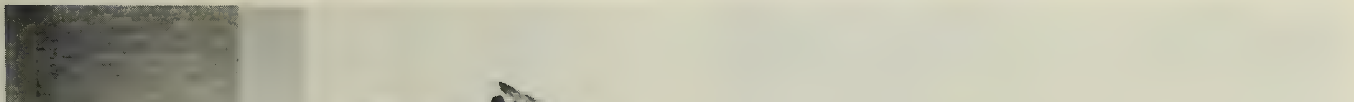

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but "essential traffic" on the city streets. Violators were subject to fines of up to $500 and jail terms of up to 90 days.

After two days of work the crews began to make noted progress. The workers had moved more than 3,500 cubic yards of snow. They cleared two of the city's three main streets which had once been clogged with snow, slush and automobiles. The weather also seemed to be on their side now. Heavy snow that had been falling on the city for weeks stopped and the driving winds became quiet. Operation "Snow-Go" pushed on faster than ever.

By Feb. 5 the Army engineers had moved more snow than expected and were far ahead of schedule. The operation was expected initially to take 10-15 days. It became apparent that the troops would be leaving sooner. Even though they were this far ahead of schedule, the task force didn't slow down a bit. Bucket loader and road grader operators took the opportunity to do something extra. In addition to clearing streets, they pitched in and gave citizens a hand at opening driveways and parking lots.

"I didn't mind opening driveways for the people," said one bucket loader operator, "the people needed the help and I wanted to do anything I could."

At one point in the operation, a bucket loader operated by Specialist 4 Timothy Goodwin, 27th Engr. Bn., traveled 14 miles to Amherst, N.Y., for a job. The "bucket" worked for hours opening fire and emergency exits at St. Francis Home, a nursing facility for the aged.

The weather remained calm and operation "Snow-Go" came to a close. When the final piece of equipment pulled out of Buffalo Feb. 7, 1977, 22 miles of roadway were clear. The traffic ban had been lifted and city traffic was flowing smoothly for the first time in months.

The unsung heroes of operation "Snow-Go" should not go unmentioned—the men who worked day and night to keep the equipment on its feet and ready for anything.

The 1st COSCOM provided 20 mechanics who worked on the equipment at Niagara International Airport and the National Guard Armory in Buffalo. In addition, COSCOM set up and maintained its own operations center which was manned by personnel from the 46th Support Group. Several members of the 330th Transportation Center provided redeployment support including assisting Air Force personnel in securing equipment on the aircraft.

The people of Buffalo showed their appreciation for the soldier's assistance in several ways. During the evening hours when the wind was howling and temperatures dropped to their lowest, citizens did what they could to comfort the troops. People came out of their homes carrying cakes, cookies and coffee to offer tired workers. Many soldiers were invited into homes for meals and just a warm place to relax.

Private George Richus, a grader operator in the 27th Engr. Bn., recalled, "It was late at night and the grader began to shake a bit, telling me that it was about time for it to break down. Sure enough, it did, right in the middle of the street. The trouble was minor, nothing to worry about. But these people came out of the house across the street to see what was wrong. When I told them, they insisted that I come into their house and have a cup of coffee to warm up. Needless to say, I did."

Buffalo gave 30 of the troops an unforgettable trip to Niagara Falls. The soldiers also visited the Robert Moses Niagara Power Plant, the largest hydro-power plant in the free world. Following the tour, they were hosted to an Italian dinner at a Buffalo restaurant.

Another 40 soldiers went to a professional basketball game featuring the Philadelphia 76ers against the Buffalo Braves.

Soldiers and equipment began departing Niagara International Airport for Ft. Bragg, Feb. 8. The redeployment ran as smoothly as the deployment. Forty flights returned them to Ft. Bragg: C-5A Galaxies made 5 trips, C-141 Starlifter 3 and the C-130 Hercules aircraft the remaining 33.

Many of the soldiers didn't want to leave Buffalo. "I kind of liked it here," said one tired 27th Engineer trooper. "It gave us all a sense of purpose and the people were very receptive." "What makes the soldier 'go' is the genuine sense of appreciation," the commander remarked. "In a disaster situation people turn to one another for help. The troops felt the urgency to do their part. When they know the citizens are behind them, and wish them well, it soon becomes more than a job."

"You may forget what you did here," Mayor Makowski said in bidding farewell to the troops at the airport. "But let me assure you that our people *will never forget* how you searched your hearts and shared your kindness with us."

Specialist 4 Robert Small is assigned to the Public Affairs Office at Fort Bragg, North Carolina where he works as an Information Specialist.

EPMS — OFFICE

Editor's Note: The following was received from MILPERCEN highlighting the newest information regarding EPMS. It is intended that the officer corps be fully aware that in order for EPMS to work, it needs the full support of that Corps. While the information contained in the article is general in nature, we of THE ENGINEER think that its use will be valuable for all Engineer Officers and Enlisted alike.

If someone were to ask you what you know about the new enlisted personnel management system (EPMS) what would your answer be? Do you really understand what EPMS is all about?

This question has been asked of many of your fellow officers. Most have been well informed, but some are still confused about EPMS. Either they lack sufficient knowledge of the subject or they perceive EPMS as strictly an enlisted matter. They don't understand where they fit into the picture. This situation is a matter of concern. Years have been spent developing a system which benefits the individual soldier and at the same time enhances the professional status of the entire Army. EPMS is a good program, but its success is largely dependent on the active participation of the officer corps. This article is designed to tell you what every officer should know about EPMS.

The old system served us well for a number of years but times have changed, and the Army had to change with them. It was recognized early on that to have a truly professional force we would have to develop a different system for the management, training, and evaluation of our enlisted soldiers. The EPMS Task Force was formed at MILPERCEN and TRADOC to work on this problem. They spent 18 months seeking the counsel, ideas and opinions from about 20,000 soldiers to develop the framework for EPMS.

During group interviews, statements like these were grequently heard: "I'm in a dead-end MOS." "I'm an E9 — been in the Army 27 years. AIT was the last formal school that I had the opportunity to attend." "I can't get promoted as long as I stay in my MOS, and the Army won't let me reclassify into a new MOS" "I'm a deep sea diver, and the Army sent me to NCOES in a transportation MOS. It just doesn't make sense." "My job is boring, and I'll probably get out after this (first) hitch." "Last month I graduated tops in my Advanced NCOES course. My current job has nothing to do with my MOS" "The green machine has had me. I can't get there (grade E8) from here (grade E6)."

Unfortunately many of these were valid comments. They described some real world soldier problems with the old enlisted personnel and education system. Clearly, a better system was needed if the Army hoped to maintain a volunteer Army of qulified, professional soldiers. A system that was not people oriented as well as mission oriented was just not going to do the job.

The causes of much dissatisfaction and many problems were found in what is known as the personnel management subsystems. These subsystems (training, evaluation, classification and promotion) tended to operate independently and were not mutually supportive of one another. Soldiers were promoted to a higher grade and then evaluated to determine their ability to perform in that grade. In other instances, soldiers, who had been performing well in a job for several years, were then sent to school to learn the same job. After reviewing situations like these, the objectives of EPMS started to come into focus.

- Every soldier needed logical job progression from grade E1 through grade E9.
- A system of career-long training that prepared the soldier to assume duties at the next higher grade had to be developed.
- Fair and reasonable promotion opportunity had to be developed.
- Soldiers needed a meaningful, challenging job at every level of their career.

In general, the attitude of the enlisted corps was that officers already had those elements built into their personnel system. "Why wasn't there the same concern for enlisted personnel?"

GETTING THERE FROM HERE

In 1972 the Army adopted a system to group Military Occupational Specialties (MOS) that were related, manageable from a personnel and man-

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power standpoint, and provided visable and logical progression from grade E1 to E9. These groupings are called Career Management Fields (CMF).

It was a good step but only the first. The next move was to further refine the career management fields to achieve the objectives of EPMS and provide a total system for enlisted professional development. Understanding how this is done in each CMF will assist later in understanding why specific changes were made.

It usually takes at least a year to develop a prototype career management field. First, information found in the automated data banks and surveys filled out by soldiers are studied. Tasks and duties performed at each grade in an MOS are analyzed. Soldiers who serve in the MOS are interviewed to gain further insight into the tasks they perform, their problems, attitudes, and recommendations. Do meaningful jobs exist at each grade level? Should the MOS be consolidated with another MOS or merged with another at the grade where the problem exists? What effect will new equipment have on the soldier's job? Is the reenlistment rate low? If so, why?

In this probing manner each MOS is carefully examined. This results in the development of several prototype career fields. The prototypes are then anlyzed by career managers, trainers, doctrine developers, and users. The most feasible receive further study: Logical job progression? MOS in the proper career field? Can it be supported with a realistic career-long training program? Job challenge? Are promotion opportunities reasonable?

Let's pause at this point to discuss promotion opportunity because promotions are a prime motivator in career development. Soldiers tend to avoid a MOS in which there is little chance for advancement. What causes promotion bottlenecks, and how can they be resolved?

MOS 13B, Cannon Crewman, is a good example. Job progression was logical and visible, (Fig. 1) but there was a promotion bottleneck in going from grade E6 and E7. This caused many soldiers to move to other MOS to get promoted. To see this clearly one had to look at the job positions found in the authorization (MTOE/TDA) documents. The number of positions available (authorizations) impact on how many soldiers can be promoted in a specific MOS.

MOS 13B
JOB PROGRESSION

E7 — Chief of Firing Battery
E6 — Section Chief
E5 — Gunner
E4 — Assistant Gunner

MOS 13B
Authorizations
TOE/TDA

Before EPMS		After EPMS
(13Z)	E8	(13Y)
13B	E7	13B
13B	E6	13B

The left column of figure 2 shows the worldwide profile of job positions at grades E6 an E7 and the grade E8 positions from the capper MOS which supports promotion flow within the career field. There were not enough 13B positions at grade E7 to support adequate promotion opportunity within the MOS. The underlying cause was the basic organization of the Field Artillery battery. In each battery there were six grade E6, Chiefs of Section, one grade E6, Ammunition Sergeant, but only one grade E7, Chief of Firing Battery. The effect was a ratio of seven soldiers competing for promotion to one position. Solving this problem involved reconfiguring battery organization, evaluating job positions, and upgrading the jobs which justified a higher grade. Upgrading jobs is not always the best solution, but in this cas it was. The MOS bottleneck was broken as shown in the right column of the chart. The advantage of being able to keep highly qualified cannon crewmen in their jobs rather that moving them for promotion purposes is obvious.

Now let's return to the development of a CMF. The prototype CMF is wargamed by a group of qualified soldiers, experienced in the MOS involved. The end product of the process is the EPMS recommended career management field.

Each career management field is then formally coordinated with the training commands, major field commands and the DA staff. When this coordination is completed and disagreements have been resolved, the CMF is presented to a steering committee of general officers representing the DA staff, major field commands and TRADOC. The Sergeant Major of the Army is also a member of the committee. During this meeting, any issues which may still exist within a CMF are ironed out, decisions are made and theCMF is approved or disapproved for implementation.

Developing a CMF is a lengthy, painstaking process involving a lot of highly qualified, conscientious people. This is what it takes for a soldier to be able to say, "I can get there from here."

Consolidating several MOS into one and merging others at a higher grade has been the source of much discussion. Some believe that this process causes a loss of expertise, while others argue that it provides the soldier with greater challenge and more variety in assignments. The EPMS Task Force had to come to grips with this problem when they began to examine the MOS structure. Some MOS's had few authorized spaces, were extremely limited in scope and offered little opportunity for advancement. A "quick fix" solution would have been to eliminate or consolidate any MOS with fewer than 150 positions. This was ruled out, because a lot of good soldiers' careers would have been hurt. Some MOS's had to be broadened at the entry level to provide both challenge and opportunity so that the soldier would want to stay in the Service. The reason was obvious. The Army can not afford the cost involved in training new people to completely refill a MOS every 2 or 3 years. Further, it is the reenlistee who eventually provides the experience and expertise that every MOS needs to survive.

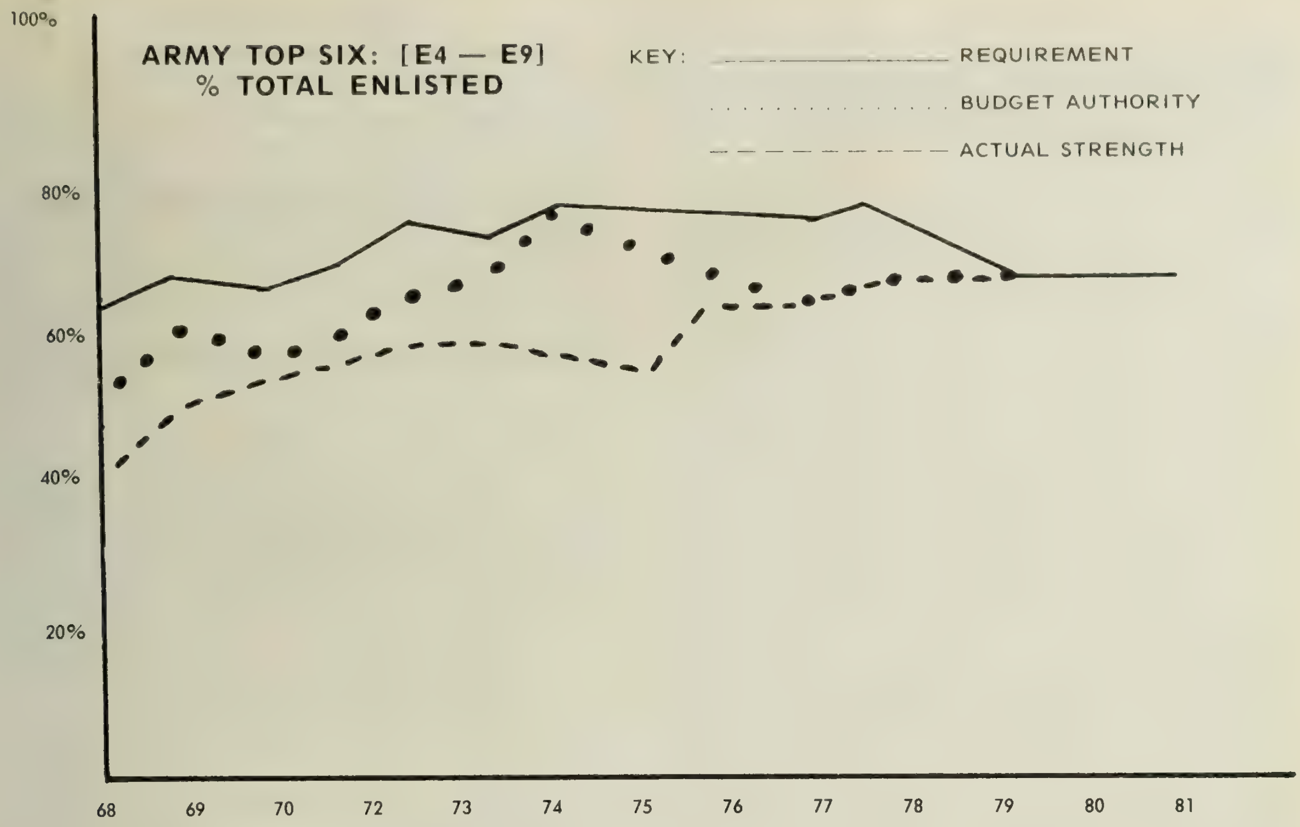
Merging of some soldiers' MOS at the leader and supervisory levels also became necessary, because some were in "dead end" MOS's. CMF 11, Maneuver Combat Arms, is an example. A very large share of the promotions to grade E9 and Command Sergeant Major selections were coming from a relatively few of the MOS in the career field. Soldiers in the other MOS's were stymied. A number of highly qualified soldiers were not being given a chance to compete for the Army's highest enlisted grade. To correct this, all E9 jobs in CMF 11 were consolidated into a single MOS. The results were increased competition and more equitable opportunity for promotion, a variety of assignment opportunities and more broadly experienced enlisted supervisors.

It has been asked if there is a conflict between more generalization under EPMS and increased specialization under the Officer Personnel Management System (OPMS). The answer lies in perspective. Before EPMS and OPMS, enlisted soldiers and officers were at opposite ends of a spectrum. Some enlisted soldiers were too specialized, and some officers were overly generalized. Under EPMS and OPMS, the two are now moving toward the center of this spectrum to provide a more balanced, responsive force. It should be noted that EPMS was not an outgrowth of OPMS. The systems were developed separately.

SLOWER PROMOTIONS?

Since 1968 all of the services have been under increasing pressure from Congress and Department of Defense to halt grade creep and bring the grade structure into alignment with budgetary constraints. Some people interpret this as a forerunner to slower promotions and maybe even a promotion freeze. This is not true.

Grades E4 through E9 are commonly referred to as the "TOP SIX" of the enlisted grade structure. Figure 3 plots the TOP SIX as a percent of the total number of soldiers. The solid line represents the Army's requirement for combat organization (total authorized enlisted strength as determined by totaling all of the TOE and TDA documents for the entire Army). This is called the required force. The dotted line represents the Congressional budgetary authorization for the TOP SIX. In other words, the number of TOP SIX soldiers for which Congress will pay. The dashed line represents the percentages of soldiers who actually have one of the TOP SIX ranks on their sleeves. When a unit commander looks at his authorization document (solid line), he perceives an NCO shortage. In reality the Army does not have the money to promote the number of soldiers stated in these documents (dotted line). At first glance it would appear that this would cause a general slow down or promotion freeze. Prior to FY 75 we rarely spent all of the money Congress authorized for promotion into the TOP SIX (dashed line). The EPMS task Force was given the mission to relook at our grade structure and to bring what the Army says it needs down to a level that Congress



will fund. At the same tiem EPMS is trying to adjust CMF and MOS so that every soldier has a greater opportunity for promotion. By 1978 the Army expects these three lines to be in close alignment. What does all this mean? To begin with, no one is going to lose stripes. On the contrary, as EPMS is fully implemented and promotion bottlenecks are reduced, more soldiers will have better opportunities for promotion. Commanders may not be authorized a grade structure as high as before, but the Army will be better able to fill by grade what is authorized. Perfection is not promised, but progress has been made. The commander will have a more realistic picture of his organization and what he will have available to complete his mission. The days of promising champagne on a beer budget are coming to an end.

From what has been said it might appear that EPMS has provided a means of ensuring that the Army will have a soldier in the proper grade for each requirement. This is not entirely true. Other factors impact on promotions that militate against perfection. We said before that authorizations drive promotions. This is true, but authorizations don't stand still for very long. They are changed to meet requirements. The authorization for a given MOS will go up or down as the Army's force structure is changed. A good example of this was the decision to go to a 16 division force. Adjustments had to be made in a large number of MOS's to allow for this expansion. As a result of such change, commanders experienced grade shortages in some MOS's and overages in others. To correct this, soldiers were transferred from overage to shortage MOS's (reclassified).

Since the Army bases promotions on future projections, this will minimize the shortage problem. Keep in mind that the success of this program is dependent upon the timely submission of document (force structure) changes. The personnel system must have time to react.

EPMS — LEADERS/COMMANDERS RESPONSIBILITY

"He is one of my best NCO, and I can't understand why he wasn't promoted." More often than not we blame the system when a deserving soldier is not promoted on time. Well, it will continue to happen until officers learn *how* to get their soldiers promoted. They *must* understand EPMS and *assume* their role in managing enlisted careers. EPMS places more emphasis on the commander's role in the professional development of his enlisted soldiers.

SKILL LEVEL

Skill level, that's the *key*. It's the glue that holds EPMS together. There are five skill levels associated with MOS. They are found in the fourth character of the enlisted MOS code — 11B20, 76Y30, 63C40. Figure 4 depicts the new relationship between grade and skill level that is standard for all MOS.

What is a skill level? Under EPMS, it reflects the skills typically required for successful performance at the grade with which the skill level is associated. What else must commanders know about the skill level? A soldier must possess the skill level of the next higher grade in order to compete for promotion to that grade. As an example, a SGT/SP5 must hold skill level 3 — 11B30 — to compete for grade E6. This provides a stimulus for professional development and precludes a soldier from being promoted beyond his current capabilities.

GETTING THE SKILL LEVEL — TRAINING

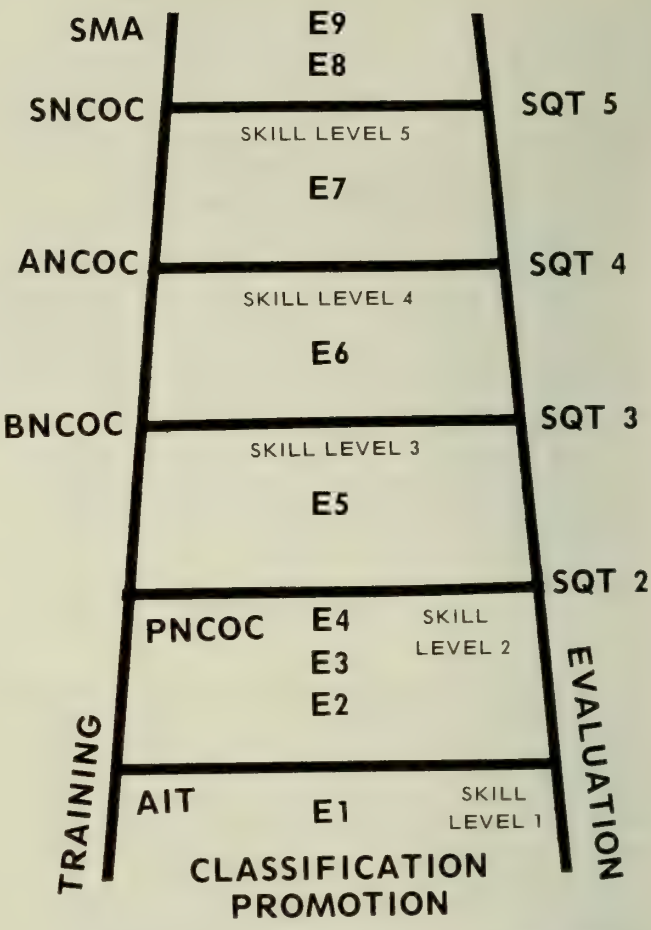
There are two ways to complete the training requirement for the next higher skill level. The first is by learning the higher skills while serving on the job. It is called On The Job Experience (OJE). The second is to complete the designated school course (NCOES). They are equal. Completing the training requirement is what is important, not the route used. This subject will be discussed later.

COUNSELING — EPMS

SGT Smith has arrived in his new unit. The First Sergeant has obtained a printout of SGT Smith's record, and the Commander is reviewing it: Single. Second enlistment. Three years, 2 months of service. Grade E5. Promoted to current grade 6 months ago. Previous commander appointed him to corporal; filled an E5 slot. Must be a front-runner. Nice to get good men. MOS 12B20. Whoa there! With maximum waivers on time in grade and time in service, Smith could start competing for E6 in about 10 months. But first he needs the E6 skill level — 3. I'll discuss that with him . . .

"SGT Smith, that about winds up this interview except for one thing — your professional development. Since the start of EPMS it is one thing that I personally monitor. Your record looks great, but you need that next higher skill level within 8 months. Here's what we can do to get you there. The first step is to locate you, grade E5, on the EPMS ladder (Fig. 5). This EPMS thing is like a track meet, and you have two hurdles to cross. First, complete either OJE or the Basic NCO Course. I just happen to have a quota for the basic course that starts next month, and you're going. Your basic course is taught over at the Division NCO Academy, so there's no TDY problem. The second hurdle is the Skill Qualification Test (SQT). You have to get that higher passing on SQT 3 in order to be awarded skill level 3, and we have about 8 months to get you ready for the test. Do you have the E6 Soldiers' Manual that covers all the critical skills you must be able to do to pass the SQT? Good! I'll be getting reports on your progress through the chain of command. You're going to find that the unit training program will help you gain proficiency in some of those critical skills. In others it will take some effort on your part."

EPMS LADDER



TRAINING AND EVALUATION

Let's refer to chart 5 again and review the significant features of the EPMS ladder. AIT normally results in the award of skill level 1. The Primary, Basic, Advance, and Senior courses teach the skills of the next higher grade level. SP4 attends the primary level to learn grade E5 duties, SGT E5 attends the basic level to learn grade E6 duties, and so on. Each soldier is administered the

SQT of the next higher level. SP4 takes SQT 2, SGT takes SQT 3, and so on up the ladder. When the training and SQT requirements are successfully completed, the higher skill level is awarded. The USA Sergeants Major Academy (USASMA) will continue to be the top level of NCO training. Note that under the old NCOES there were only Basic and Advanced levels and the USASMA. Under EPMS two additional levels, Primary and Senior, have been added. These successive levels of training are the cornerstones for maintaining and increasing the proficiency and expertise of the NCO corps. But don't forget, OJE also is an equal and totally acceptable route to the development of professional qualifications.

A number of new course names such as Primary Technical Course, Primary Leadership Course and Basic Technical Course are entering our training vocabulary. What are they, and how do they fit into the NCOES under EPMS?

NCOES

Level of Training	Combat Arms		Combat Support/ Combat Service Support
Senior NCO Course	Functional Course	or	CMF Course
Advanced NCO Course	Advanced NCO Course	or	Functional Course Course
Basic NCO Course	Basic Technical Course	and/ or	Primary Leadership Course
*Primary NCO Course	Primary Technical Course	and /or	Primary Leadership Course

*Will become mandatory for MOS 11B, 11C, 11D, 11E, 12B, 13B, 13E, 16P, 16R in late 1977.

Essentially they are new, more descriptive names for the Combat Support NCOES courses (Fig 6). This figure does not mean that every support MOS will have a course available at every level of training. Availability will depend on the technical requirements of each job. For example, MOS 95B, Military Police, will have both a primary and basic course at the lower levels and some type of course at the advanced and senior levels. MOS 34H, ADMSE Repairman, will have a primary course, some type of advanced and senior level course but no basic course. If a support MOS requires leadership duties at grades E5 or E6, a primary leadership course will be available as appropriate.

Our road map is almost complete. As mentioned earlier, OJE is the route to a higher skill level when there is no school course at a level of training or if the soldier does not attend the school course (Fig. 7).

Skill Level Progression

Route A	Complete NCOES Course	Pass SQT	Higher Skill Level
Route B	Complete OJE	Pass SQT	

Successful completion of OJE is judged by the commander. A minimum of 6-months service for award of skill 2 and 3 and 12-months service for award of skill levels 4 and 5 are the prerequisites. This service must be in a job calling for the soldier's primary MOS at the current or next higher grade. OJE service does not have to be continuous. Part could be completed in one unit and the remainder in another.

To ensure that OJE and school courses are given equal weight, promotion boards will be given very specific guidance on this point. It is a real-world fact that the OJE route will require more individual application and initiative. At the same time the soldier will usually contribute a full day to his unit. OJE will be given due recognition under the EPMS promotion system.

POSSIBLE MISSION

No one doubts the complexity of the personnel management business. This is especially true in the Army. In the past many commanders were confused and somewhat mystified as to where they fit into the picture. Times have changed. The success of EPMS depends upon the Commander's understanding and involvement in the system. Under EPMS the role of the Commander has been well defined. The key is knowing how to assist the soldier in obtaining the next higher skill level. For the soldier this means greater proficiency, job satisfaction and promotion. For the Commander this means a better soldier, a better unit and increased combat readiness. That's what EPMS is all about.

SUPPORTING TODAY'S

LTC Mark H. Magnussen

Energy, especially electrical energy, is a major concern to Army planners today. This is due primarily to large increases in fuel costs in the last three years and the realization that the United States is too dependent upon vulnerable foreign oil sources. This has not always been the case, for the Army has virtually neglected the electrical power field for decades, except for developments in nuclear power and some efforts to improve tactical generators.

Despite repeated experiences with being unpre-

LECTRICAL ARMY

pared for meeting electrical power requirements in World War II and Korea, the Army was still not ready to provide the electricity needed by the troops which it committed to Vietnam, particularly high voltage (*Military usage defines high voltage as 600 volts or higher*) power for base support.

Although long pointed out by the Corps of Engineers, the Pentagon was not able to recognize the importance of the increase in gross per capita electrical power demand in the Theater of Operations from 0.1 KW/man in World War II to almost 1.7 KW/man in Vietnam. Emphasis, of necessity, has been placed upon low voltage tactical generators which could not meet the ultimate demand.

As a result, more than $191 million was spent from May 1966 to June 1968 to provide approximately 300,000 KW of utility power for bases in RVN. An additional 200,000 KW of tactical power was also employed.

A limited production base and long lead times for large utility generators made it necessary to procure a mixture of American and Japanese equipment to satisfy RVN demands. This caused major maintenance and support problems which further increased expenses. The inability to obtain equipment quickly led to costly decisions such as the reactivation of 11 World War II tankers which were sent to provide port power at a cost of $41,557,831, almost $600 per kilowatt plus operating expenses. The lack of adequate power for the support base at Okinawa led the Corps of Engineers to repurchase a power barge which they had sold following World War II and operate it at that site.

The need for a capability to provide high voltage power production for base support was widely recognized during the Vietnam War. As a result, the Chief of Engineers was able to convince the Army Staff of the need to develop a reserve power capability which could meet the needs of future contingencies. In 1970 the Chief of Staff approved the establishment of the Nontactical Generator (NTG) Program by the Corps of Engineers.

The purpose of this program is to provide an insurance level of nontactical power resources, to include trained manpower and support capability. The initial assets of the program were to be the electrical power equipment withdrawn with our forces from Vietnam and other resources of the Chief of Engineers. An initial goal of 250,000 KW of generating capacity was set. Although not adequate to meet major contingency requirements, it is sufficient to furnish initial needs while more equipment is being acquired.

The Assistant Secretary of the Army for Installations and Logistics subsequently broadened the mission of the program in 1970 to make its resources available to DOD and other federal state agencies for emergency loan to support both civil and military disaster relief and related purposes.

The job of developing and implementing the NTG Program was given to the U.S. Army Facilities Engineering Support Agency, a field operating agency of the Office of the Chief of Engineers. As the agency responsible for the Army Nuclear Power Program, USAFESA had considerable experience in the field and a cadre of trained power plant personnel who could take on this added responsibility.

Among the major items included in the program are the four Corps of Engineers power barges. These are the STURGIS, a 10 MW nuclear plant; the WEBER, a 21.7 MW combination diesel and gas turbine plant; and the INDUCTANCE and IMPEDANCE, both 30 MW oil fired steam plants. The STURGIS and WEBER are currently based in the Canal Zone in support of the Panama Canal Company. The INDUCTANCE is stationed in Guam, while the IMPEDANCE recently moved to Saipan after being overhauled in the Philippines.

Equipment recovered from Vietnam included twenty 4.5 MW General Motors diesel plants

which are the mainstay of the transportable plants in the program. Each plant consists of three 1500 KW generators and a control unit, each housed in its own individual module. The plant provides an excellent operational capability, but is hampered by the 55 ton weight of each generating unit.

Sixty-eight Schoonmaker generators and control units were also returned from Southeast Asia. These units can be configured into 1500 KW or 2000 KW plants, but the requirement for housing them in a building hinders their rapid employment.

A few 700/750 KW self-contained diesel generators were also retrograded, along with a large number of transformers and other transmission system equipment. The last of this equipment is presently undergoing complete overhaul by DARCOM and being placed in storage at Tooele Army Depot.

Since the program's inception, six trailer mounted 750 KW gas turbine power plants have been added to the inventory, giving it a fast response capability in emergency situations. The value of this equipment was demonstrated in the fall of 1974 when, following a Presidential Disaster Proclamation, three units were air lifted to Kodiak, Alaska. They were moved from Fort Belvoir, Virginia, and put into operation at Kodiak in less than 36 hours, including a 12 hour delay due to bad weather. This rapid response averted an economic disaster to the town which had lost 50% of its power supply in the middle of the seafood processing season.

The Army now has 225,000 KW of power generating equipment in the NTG Program inventory. Planned procurements over the next five years will add another 61,000 KW in new equipment. This will meet the 250,000 KW goal and allow replacement of some of the Schoonmaker units which are not self-contained. These new plants will be 750 KW diesels and gas turbines which can be easily moved and set up, adding needed flexibility to the program's capability to respond quickly to contingency needs.

Although the NTG Program is still in its infancy, it has already provided valuable services. In addition to the Kodiak deployment, transportable plants have been sent to Thailand, Jamaica, Kwajalein, Samoa, and numerous CONUS sites. Missions have ranged from support of R&D tests to temporary replacement of deadlined power plants.

A limited pool of trained manpower to fulfill peacetime emergency requirements for NTG equipment and provide a cadre for military contingency deployment is available within the Facilities Engineering Support Agency. Personnel maintain their skill through assignment to the STURGIS or WEBER and a variety of field support assignments for OCE.

The availability of trained power specialists to meet Army requirements has proven a boon to Facilities Engineers, especially at Army Security Agency and Army Communication Command stations where a large percentage of communications problems are linked to power failures. Teams from USAFESA recently spent six months in the Far East performing relay calibration and coordination work at sites in Korea, Japan, Okinawa, and Taiwan. Additional support missions identified by OCE are planned as the resources become available.

Despite the successes of the program, many problems still must be solved before the Army is ready to meet the challenge of providing adequate electrical power for a major contingency. Doctrine must be developed so that detailed planning in support of contingency plans can be accomplished. The Training and Doctrine Command is now conducting a study which should provide a basis for developing properly sized units and support systems for deployment, installation, operation, an maintenance of NTG plants and high voltage transmission systems during military operations.

Regardless of the problems, the Army seems to have broken the cycle of losing its high voltage electrical power capability after each war through disposal of equipment and reduction in personnel skill levels. It has come a long way toward developing a critically needed capability. Its significance will be seen in the years ahead when electricity becomes an even more important factor in Army operations and memories of the many problems encountered in this area in Vietnam grow fainter.

Editors Note: The cycle referred to by the author evidently has not been broken. Since this article was written the INDUCTANCE has been offered to the Navy, the WEBER redeployed to the Dominican Republic where it will be operated by a civilian crew, and the STURGIS returned to Fort Belvoir for decommissioning.

ANSWER TO OUR PROBLEM

Continued From Page 10

STEP 3

Divide remaining bridge length by 2 to give minimum length of clear spans on either side of the C/L 60 trestle arrangement - $\frac{75'}{2} = 37'\ 6''$.

STEP 4

Select clear span from table 6-23 (Dec 69) or table 6-6 (Sep 76) of FM 5-34. Try 38' 4" span with balk pattern 26/18. Although this appears suitable for length and load capacity, the C/L 60 trestle arrangement will only take balk patterns up to 22' wide.

STEP 5

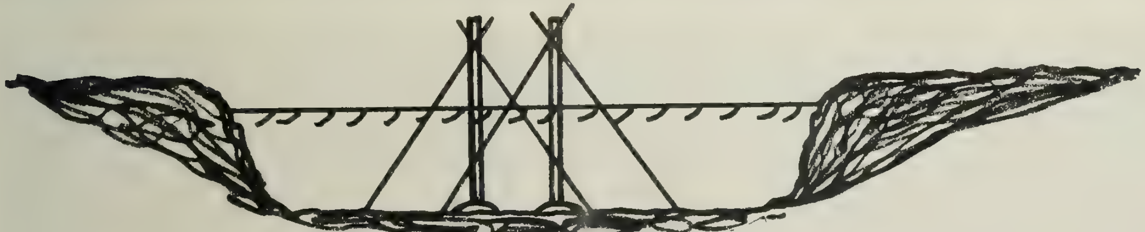
As there is no suitable span at 38' 4", add another C/L 60 arrangement and subtract a further 15 ft to give remaining bridge length of 75 ft - 15 ft = 60 ft.

STEP 6

Repeat steps 3 and 4. This should result in two clear spans 30' 0" long with a 22/18 balk pattern.

The completed design is shown below.

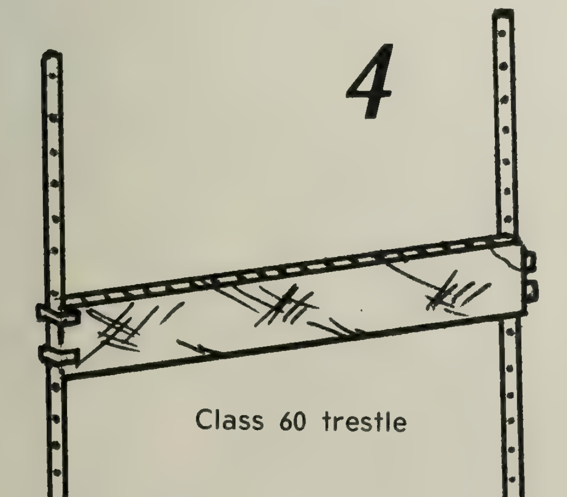
2



Class 60 trestle arrangement.

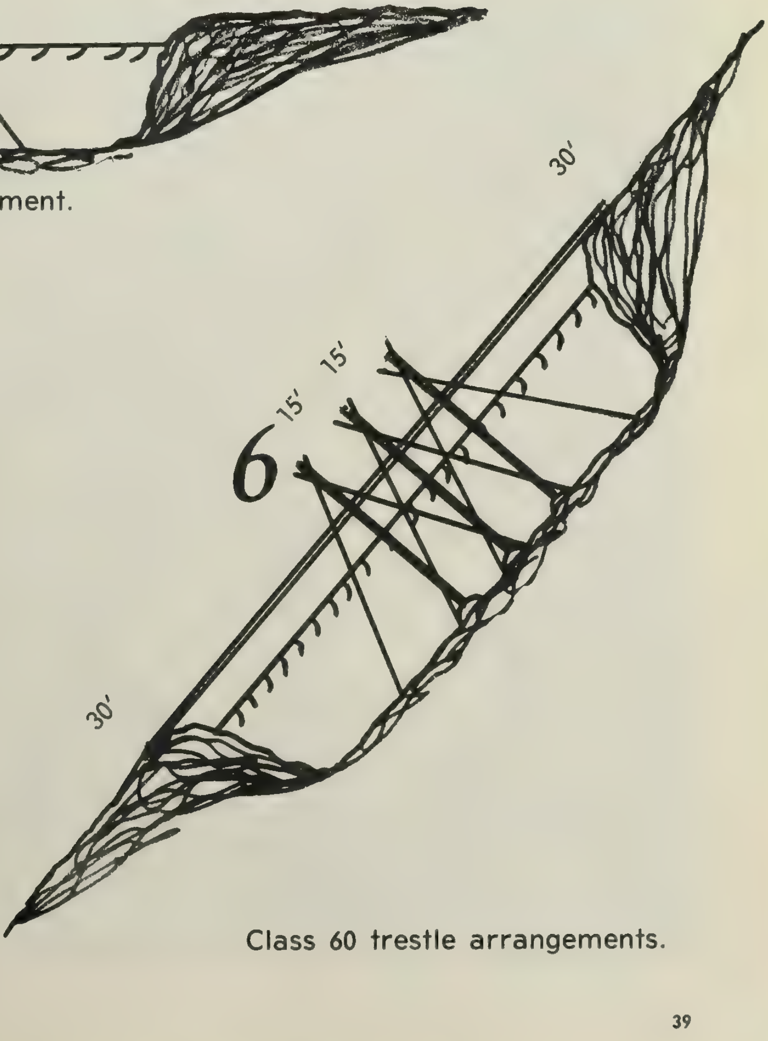
Only 22 balk spacings available on transom.

4



Class 60 trestle

6



Class 60 trestle arrangements.

WHAT GOES UP - MUST COME DOWN

SP4 Jack Frear

Patrick AFB, Fla.—"T-minus 10 seconds and counting!"

In the distance, the massive looking service tower on Cape Canaveral Launch Complex 14 has been pulled away from the Friendship 7 Atlas rocket in preparation for launch.

"T-minus 5 seconds . . .4 . . . 3 . . . 2 . . . 1 . . . Ignition!"

Fire streams from the rocket engines, bathing the launch pad in smoke and flame as it lifts Astronaut John H. Glenn Jr. into his historic journey of three orbits of the earth.

So it was Feb. 20, 1962, and now, almost 15 years later . . .

"T-minus six minutes and counting!" blares the public address system.

In the distance, the massive service tower for complex 14 rises abruptly from the dunes.

"T-minus three minutes!"

The tower stands against 25-knot winds blowing rain and salt spray from the nearby ocean.

"T-minus five seconds!"

An intense flash of light springs from the base of the tower, quickly followed by a loud explosion and a dark billowing cloud of smoke. The tower seems to hesitate, then falls heavily forward to earth, hitting hard enough to send pieces of steel flying through the air.

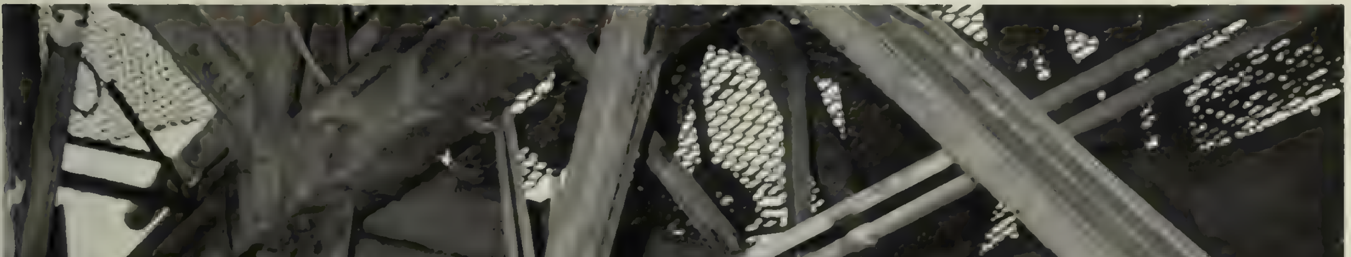
The 19-year old tower, unused for almost 10 years, was destroyed by a five-man demolition team from Ft. Bragg's 27th Engineer Battalion.

"We have a two-fold mission here: to help the Air Force destroy these three towers (Complex 14 and two towers on Complex 12) and also to use this as a training exercise in demolition work," said Staff Sergeant James E. Skellion, noncommissioned officer in charge (NCOIC) of the demolition team.

Complex 14 was designed to support Atlas "D" operations (as in the Project Mercury man-in-space program with the Glenn, Carpenter, Schirra and Cooper flights).

Throughout its use, complex 14 had numerous modifications including work on the service tower and a new umbilical tower for the Atlas/Agena launches.

In addition to tower 14, the team also destroyed the service and umbilical towers on launch complex 12.



Complex 12 was also designed with the Atlas "D" operations in mind. Some 37 launches were made from complex 12, while complex 14 launched 32 rockets — a total of 69 manned and unmanned launches from the two tower complexes.

Complex 12 was deactivated in 1966 while complex 14 was deactivated in 1967.

The three badly decayed and rusted towers presented a safety hazard to other activities in the area. Those same hazards prevented normal dismantling operations, resulting in the decision to destroy the towers by toppling them with explosives.

Some 230 pounds of plastic explosives (C4) were used to blow a 45 degree wedge from the base of tower 14, while 129 pounds were used to drop the complex 12 towers.

After its destruction on Dec. 1, tower 14 was used for test explosions to "Determine a more precise method of placement" for the explosives, said Staff Sergeant Skellion.

This more precise method, called "ribbon cutting," uses less explosives and was used Dec. 2 on the two remaining towers on complex 12.

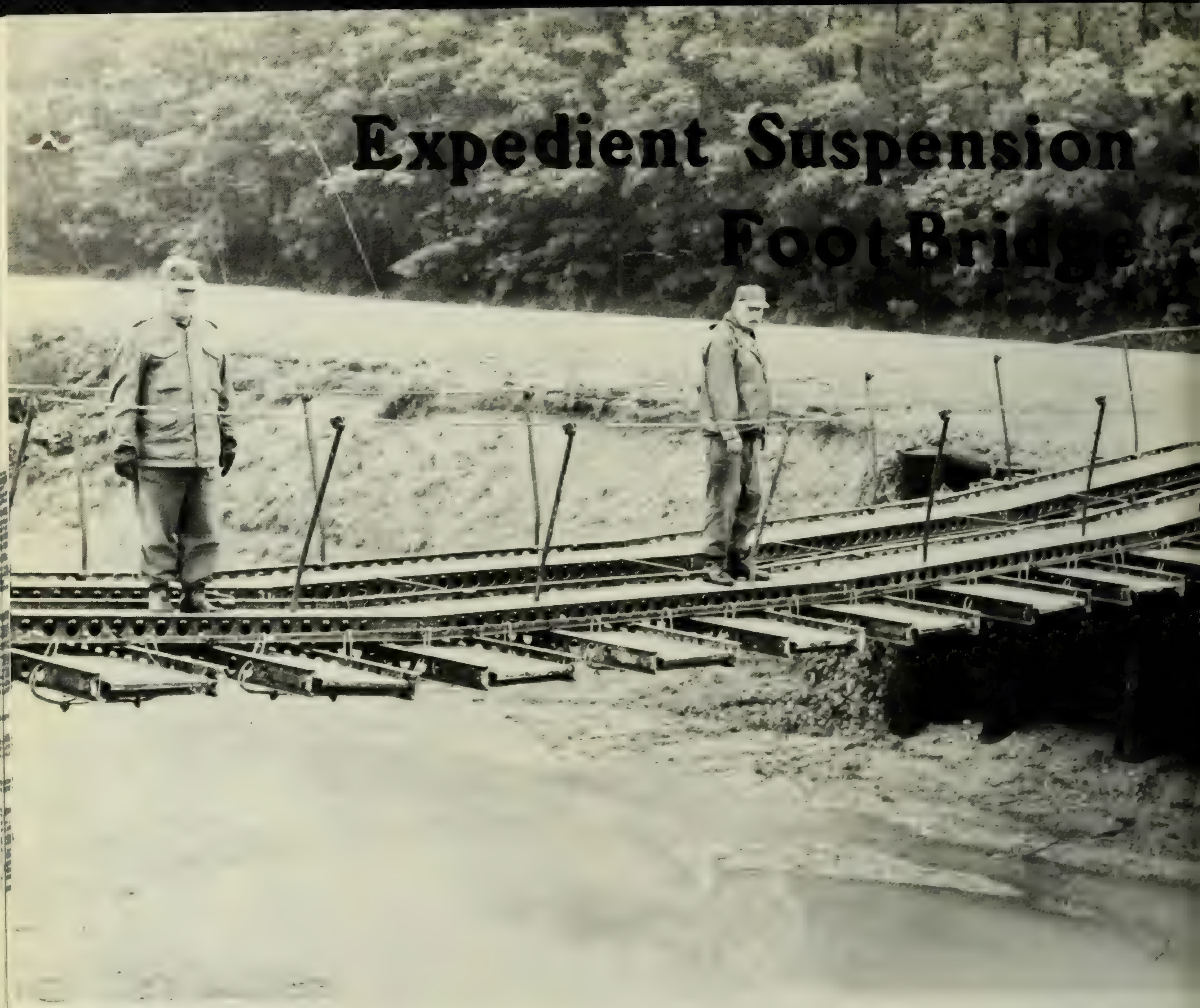
Both methods of destruction were effective and according to Captain James E. Baumgardner, safety officer, "We put those towers right where we wanted them to go."

"Although demolition is just a small part of our mission in the battalion, this (the Canaveral demolitions) is good training for us. I can't imagine finding a bigger tower to work on. The fact that we've been there and have done this type of work will be filed away and if a similar job comes up, the Army will know we can handle it," Skellion said.

"We are combat engineers, meaning that we work, using engineer resources, to increase the ability of the supported unit to perform its mission We basically help the other guys to do their job."

Specialist 4 Jack Frear is a writer in the Public Affairs Office of the 18th Airborne Corps and Fort Bragg, Fort Bragg, North Carolina.

Expedient Suspension Foot Bridge

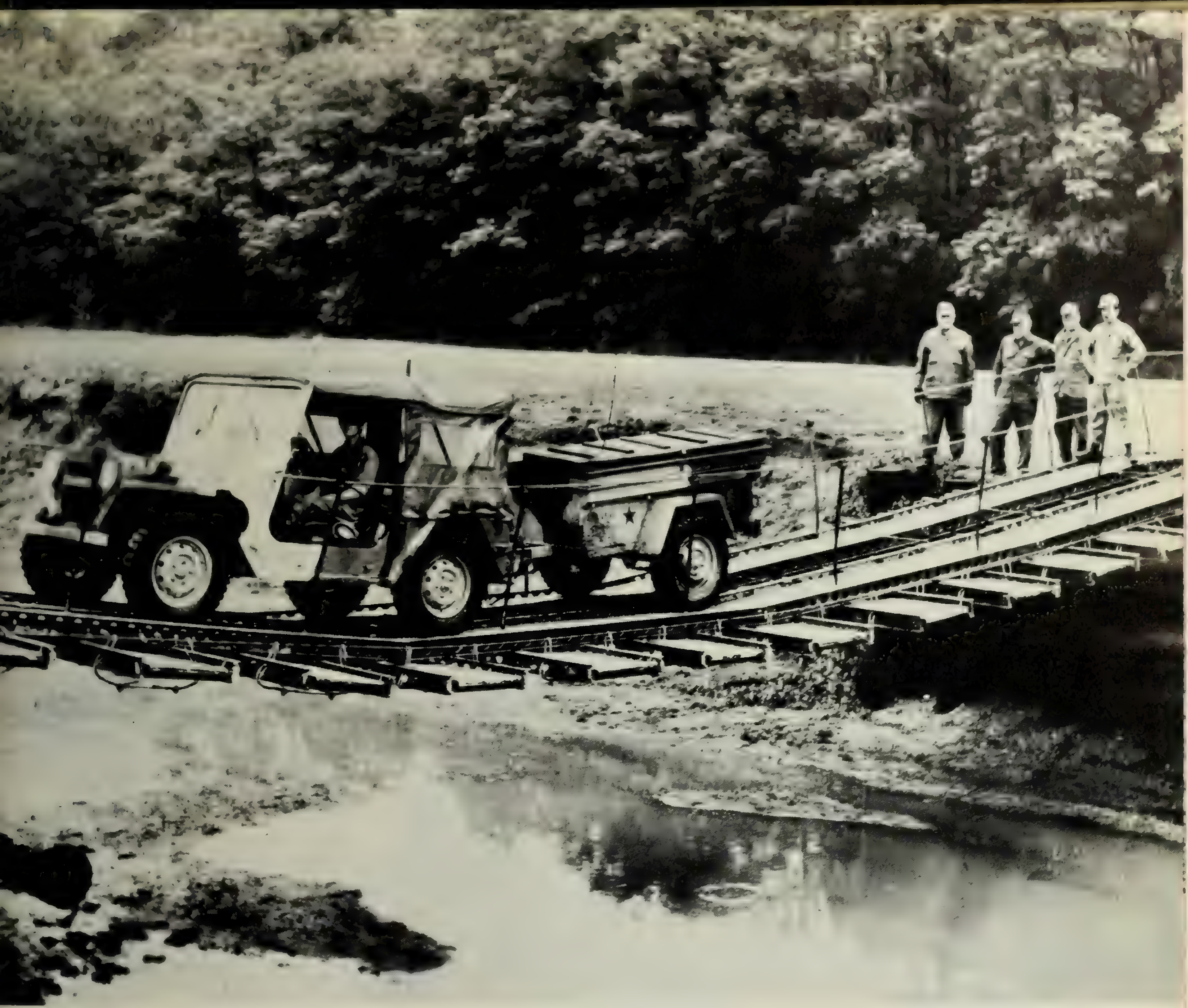


CPT Timothy P. Drozd

Editors Note: This article depicts innovativeness in the use of available Engineer bridging materials. Although it is not a part of Engineer bridging doctrine, it may be the solution to some critical problem in an emergency situation. The 8594th was successful in their operation, however, we strongly recommend that **all** aspects of safety be checked out prior to duplicating the operation as there is 'no validated load capacity or required safety measures available.

The 8594th Engineer Company Float Bridge (FB), Civilian Labor Group (CLG) was given the mission to construct a suspension bridge, using the Aluminum Footbridge Set, capable of supporting a 1/4 ton truck with trailer. The selected bridge site was a ravine 44 feet wide by 12 feet deep. Initially, two 3/8" Improved Plow Steel (IPS) suspension cables were installed and anchored to 12 each "D" handled metal pickets on both the far shore and near shore. On the near shore side of the ravine the suspension cables were elevated to three feet off the ground to facilitate the launching of the aluminum treadways which were used as stringers. The elevation of the suspension cables was done by turning two aluminum footbridge pontons over and running the suspension cables over the bottoms of the pontons.

The treadway stringers were attached to the suspension cables with 3/8" IPS cable slings. These slings were 3 feet in length and run around the suspension cable then through a hole on one side of the treadway, then under the treadway, back up through a hole on the other side of the treadway, and again around the suspension cable at which time the loop was completed and



connected together with wire rope clips. As each stringer treadway was connected to the suspension cables it was pushed toward the far shore. A total of 23 treadways were used as stringers. After all of the stringers were in place, the cables on the near shore side were lowered back to ground level and tightened. At this time the roadway, consisting of aluminum treadways, was installed perpendicular and on top of the stringers with one linear length of roadway treadway per every three treadway stringers. The roadway consisted of two parallel rows of treadway which were kept a proper distance apart by the use of a spacer bar. One spacer bar was placed above every other stringer.

The dimensions of the spacer bar are 1/2" in diameter by 25" long. On each end a small 1/2" in diameter by 3 1/2" long bar was welded and these end pieces were inserted in the holes on top of the aluminum treadway roadway. To keep the roadway treadways from sliding on the stringers, 1/4" rope was used to tie the stringers to the treadway. At this point handrail posts and handrail lines were installed as a safety measure.

Upon completion of the project, a 1/4 ton truck towing a loaded 1/4 ton trailer crossed the bridge with ease. All materials used in the construction of the bridge with exception of the spacer bars and some extra "D" handled pickets are readily available in the Aluminum Footbridge Set.

Captain Timothy P. Drozd is presently serving as the S-3 of the 565th Engineer Battalion. He previously served as a Platoon Leader with the 809th Engineer Company (PB), Platoon Leader with the 275th ADM Company, and as an assistant S-3 for plans at 7th Engineer Brigade Headquarters. He has completed OCS, Airborne School and EOBC. CPT Drozd holds a Bachelor of Architecture from Case Western University.

HELPING HANDS

Approximate 150 members of Company C, 76th Engineer Battalion from Ft Meade, Maryland were assigned to duty at West Point last fall with the Directorate of Facilities Engineering. The men of "Chargin Charlie" constructed some field latrines and renovated some existing latrines to accomodate female cadets. Ground work in and around the Recondo area and Camp Buckner kept the Earthmoving Section occupied. Several carpentry projects which required Charlie's attention also were completed.

"The men really got into the spirit of the work there," says the Company Operations NCO. "They don't get a chance to actually build too much at Ft Meade, and this is a real opportunity for them to feel the pride of building something new, and also to get practice in areas in which they should be MOS proficient."

INDUSTRIAL ◆ CONSTRUCTION

ENGINEER

COLONELS:

ASSIGNMENTS. With the command list not published until February this year, we were later than usual in getting summer reassignments firmed up. One factor that contributed to this was the lack of up-to-date preference statement on those expecting reassignment. To help mitigate this problem next year, those of you who expect reassignment in CY 78 please ensure that your preferences are made known by November 1977.

OPMS COMMAND. The recently announced Command Selection Board results reflect the policy that allows colonels to serve in only one OPMS command position.

MAJORS:

COMMAND AND GENERAL STAFF COLLEGE. Congratulations to all those selected for this year's Command and General Staff College [CGSC] class. Many of you have been placed in a deferred category which means you have not completed 24 months on station in CONUS as of 1 September 1977; have not completed five-sixths of your overseas tour; or, you are "operationally" required in your present job. However, if you are in YG 62, these policies do not apply and you will attend this year.

Many of you have inquired about switching from CGSC to the Armed Forces Staff College [AFSC] or the Navy, etc. Majors Division does the actual slating on who goes where. Many factors are considered in the slating process. Stability constraints are high on the list. In other words, if someone has not completed two years [or five-sixths] of his/her tour by 1 September 1977 but has done so by 1 January 1978, he/she is a likely candidate for the January 1978 AFSC course. Other considerations include completion of CGSC NRI, follow-on assignment after completion of AFSC academic background and your preferences.

ASSIGNMENTS. As many of you realize, 1977 is a "big move" year for Engineer majors. To date there have been a total of 82 overseas requisitions received. That means many of you are going back for your fourth or fifth overseas assignment. Those of you that do not have four overseas assignments to date can expect an overseas assignment upon completion of 30 months on station.

Army Readiness Region [ARR] duty positions are still high priority fill. At present the total requirement for Engineer majors is 80. Since there are only 712 Engineer majors, most can expect an ARR assignment at some point in their career. Many of you have asked if these are "good" positions in which to serve or are they "dead-end." If you perform in an outstanding manner while assigned to an ARR, then it is a "good" position for your career — as are all other outstanding performances. That is the bottom line!

CAPTAINS AND LIEUTENANTS:

PROMOTIONS. Captains with DOR through 31 August 1969 will be in the primary zone for Major [AUS]. If you are in the zone of consideration, you should be already getting your official file reviewed and ready. Some things to consider —

- Current Official Photo — required every fourth year during your birth month [AR 640-3].
- Updated Officer Record Brief — reviewed annually [Chapter 6, AR 640-2-2].
- As applicable, Service School and Civilian Institution Academic Evaluation Reports [AR 623-1].
- Transcript of College Credits [AR 621-1 and AR 640-10].

POTPOURRI

- Individual letters of commendation and appreciation, PE registration, EIT, etc.
- Officer Efficiency Reports:
  - Missing reports
  - If applicable, "complete the record" report [Paragraph 2-2p, AR 623-105].

Congratulations to those lieutenants selected for promotion to Captain [AUS].

WARRANT OFFICERS:

MOS CONSOLIATION. MOS 351A0 — Power Station Technician has been merged into MOS 521A0 — Unilities Operation and Maintenance Technician. This consolidation was announced by Change 28, AR 611-112, and DA Circular 611-51, which were effective 1 September 1976. At the same time, a new Special Qualification Identified [SQI] was installed to reflect those elements of the old MOS 351A0 that were not encompassed in MOS 521A0. The new SQI is "N" — Nuclear Power Plant Superintendent. All duty positions and all personnel previously classified in MOS 351A0 should now be classified in MOS 521AN. MOS 351A is now obsolete and it should be expunged from both individual qualification records and manpower authorization documents. Warrant officers holding MOS 521A0 may seek qualification training leading to award of SQI "N," and those holding 521AN may also opt for a broader range of duty by seeking assignment to MOS 521A0 positions.

WARRANT OFFICER SENIOR COURSE [WOSC]. A HQDA Selection Board will meet 12-29 April 1977 to select the students who will attend the WOSC in 1978. Selection results will be announced in May 1977.

FOR ALL:

PREFERENCE STATEMENTS. Please, please submit and update your preference statements at least nine months before pending reassignment. We can better serve you if we know your assignment desires.

REVIEW OF OFFICIAL FILE. You can make arrangements to review your official file by:

- Writing — HQDA [DAPC-PSR-S]
  200 Stovall Street
  Alexandria, Virginia 22332
- Calling — Commercial: 202-325-9618
  Autovon: 221-9618

At least two working days advance notice is required to ensure availability and completeness of the file.

If you are unable to personally review your file, two options are open:

- Provide another officer visiting MILPERCEN with a Letter of Authorization to include visiting officer's name, rank, and SSN, as well as specific authority granted, i.e., to review files, make copies of file, etc.
- Write Commander, MILPERCEN, ATTN: DAPC-PSR-SR, and request a complete copy of your file be made and forwarded to you. The charge is $2.00 for the first six pages and 5 cents for each additional page. If the file has been converted to microfiche, it will be provided only in this mode. The charge is $2.00 for the first fiche and 5 cents for each additional fiche. The bill will accompany the reproduced file. You may cut costs by requesting only the efficiency section [the section that goes before a selection board and includes OER's, letters of apprecia-

ENGINEER

tion, etc.]. Any officer can request his/her entire file and there is no restriction on the number of times an officer can have his/her file duplicated.

RA INTEGRATION. Reserve officers who have demonstrated above average potential for future development and advancement are encouraged to apply for the Regular Army in accordance with DA Circular 601-64, dated 30 September 1976.

The following provisions of the circular are highlighted:

- Applicants in Year Groups 1956-67 must have a General Officer's indorsement due to RA overstrength in these year groups.
- Regular Army selection boards will convene in September 1977 and in March 1978. Applications should be submitted prior to the end of June 1977 for the September board and prior to the end of January 1978 for the March board.
- Officers who are not selected by one RA board may reapply after one year.

DEFENSE LANGUAGE APTITUDE TEST. Army Regulation 611-6 requires that all officers with less than 17 years of active commissioned service be administered the DLAT, a 30-minute written test designed to measure an individual's ability to learn a new language. Officers not in compliance with the directive should contact their local personnel officer to arrange DLAT testing. Scores are recorded in official personnel records and are used in making selections for language training. This score is of vital importance to officers approaching their eighth year of active commissioned service, and to those officers who elect the Foreign Area Officer [SC 48] alternate specialty.

ENGINEER PERSONNEL MANAGEMENT CONTACTS IN OPMD.

- Colonels Division [DAPC-OPC-AE]
  Engineer Assignments, LTC Tom Sands, x7871
- Lieutenant Colonels Division [DAPC-OPL-AS]
  Engineer Assignments, LTC Henry Covington, x0423
- Combat Support Arms Division [DAPC-OPF-E] [Company Grade]
  Engineer Branch Chief, LTC Norman Kuhlinski, x0650
  CPT Assignments, MAJ James E. Korbin, x0651
  LT Assignments, MAJ Michael R. Foster, x7434
  Professional Development, MAJ Ken Kessler, x0617
- Warrant Officers Divison[DAPC-OPW-AU]
  Engineer Assignment, CW3 Frank Russell, x7837
- Professional Development Division [DAPC-OPP-S]
  Engineer Specialty Monitor, MAJ Tom Ostenberg, x0417

NOTE: Commercial telephone line: Listed number preceded by Area Code 202-325-
Autovon line: Listed number preceded by 221-

If you cannot call, please write to the following address:

Commander
US Army Military Personnel Center
200 Stovall Street
ATTN; [appropriate office symbol]
Alexandria, Virginia 22332

POTPOURRI

You anxiously flip through the promotion list to see if your name is there. You find the last name but your first name, middle initial doesn't appear. Dejectedly you sit back and wonder why. If this is the case, then the following written on pertaining the low selection and the of Reserve Command Sergeant Major may apply to you and your records.

Army Reserve E-9's didn't fare too well on the last Command Sergeants Major board. Officials said that the low hike rate was due mainly to administrative errors, oversights and sloppiness. A few examples are listed below.

- MOS evaluation. Records showed high efficiency ratings and low MOS evaluation scores. This indicates a lack of technical skill on the part of the individual. Home study, correspondence courses and "boning up" on the appropriate regs could have raised the evaluation scores.
- Senior enlisted evaluation reports. The written narratives did not support the high ratings. Lack of proper care by raters, reviewers and indorsers as well as those responsible for administrative review and forwarding was the cause in this case. In addition, there were mathematical errors in assigning and totaling points.
- Personal qualifications. Individual qualifications were not specific enough. In many cases where schools, college and correspondence courses were listed there were no diplomas, transcripts or certificates of completion available.
- Full-length photographs. Some applications were submitted without full-length photographs, which could have been a cover-up for large waistlines. These photos are required for promotion consideration.

It is important for the individual, as well as administrative personnel, to screen military records before the records are sent through channels to promotion boards.

The low selection rate occurred only in the Army Reserve, Army National Guard had an 83.0 percent selection rate compared to the USAR rate of 31.5 percent.

ARMY RESERVE CSM HIKE RATES LOW

MILPERCEN has announced several major changes to the enlisted evaluation reporting system. Some of the changes went into effect on January 1, and the rest becomes effective when the change to chapter 8, AR 600-200 got into the field in March.

As of January 1, a DA Form 2166-5, Enlisted Evaluation Report (EER) will no longer be submitted for personnel below the grade of E-4.

An initial report is required when a soldier is promoted to E-4, if he or she has not previously had a report submitted. If the soldier has received an EER in grade E-3 or below, the individual will receive another EER only after promotion to E-4, on an annual basis, or upon a change of rater.

Rating schemes developed in units or sections are now required to include all soldiers in the grade of E3 and above. This is to insure that the rater, indorser and reviewer will have been designated when an E-3 is promoted to E-4, prior to submission of the initial report.

Another major change allows soldier supervisors in the grade of E-5 to rate soldiers in the grades of E-3 and below.

Annual reports will be submitted according to a new schedule: E-4 — September, E-5 — August, E-6 — June, E-7 — April, E-8 — February, E-9 — December. There is the possibility of a change in the reporting month for the E-4 EER, MILLPERCEN officials said. This would reduce the number of E-4 and E-5 reports submitted within a 30 to 60 day period.

BRIDGING

EOAC GUIDELINE PROVIDED

If you anticipate attending the Engineer Officer Advanced Course in the near future, the following is provided for your information:

a. Family housing is normally available to EOAC students within a few days after arrival. The houses are basically three bedroom, two-story duplexes. Arrival at Fort Belvoir prior to the start of class is encouraged in order to secure housing and become settled.

b. Officers should arrive with both greens and fatigues in their possession since unaccompanied baggage and household good shipments are often delayed.

c. The primary uniform for EOAC students is the fatigue uniform, though the Army Green uniform is required during the first week of class and at other ceremonies throughout the course. The service cap (visor) is the prescribed headgear for wear with the Army Greens during EOAC.

d. Engineer Branch, MILPERCEN conducts Career Management Day, with individual counseling, during the second week of the course.

For additional information write to the Commanding Officer, HHC, 3d Battalion, USAECBDE(P), Fort Belvoir, Virginia 22060.

EPMS IMPLEMENTATION OF CAREER MANAGEMENT FIELD 81 (TOPOGRAPHIC ENGINEERING)

DA Circular 611-52, 26 October 1976, announces the implementation of Change 7 to AR 611-201 which includes the redesign of CMF 81 under EPMS. All changes to both MOS and skill levels within this career field will be accomplished by 23 March 1977 for active army and 30 March 1977 for the reserve components.

The major impact for most personnel will be the conversion of skill levels to the new EPMS standard i.e., E1-E4 skill level 1, E5 skill level 2, E6 skill level 3, E7 skill level 4, and E8/E9 skill level 5.

The following is a summary of major changes by subfield:

- **Cartography:** MOS 81A (General Draftsman) deleted with functions and duties absorbed into MOS 81B, 81C, and 81E.
- MOS 81C (Cartographic Draftsman) — Stereocompiler functions consolidated as ASI "C" and E8/E9 duties moved to new MOS 81Z (Topographic Engineer Supervisor). MOS 81C redesignated as cartographer.

MOS 81E (Illustrator) — Moved to CMF 84 (Public Affairs and Audio Visual).

MOS 81Q (Terrain Analyst) — Deleted with duties being identified by ASI "E5" to MOS 81C.

Survey: MOS 82A (Rodman and Tapeman) deleted with functions and duties being absorbed into MOS 82B and 82D.

MOS 82D (Topographic Surveyor) adds duties of MOS 82E (Topographic Computer) which was deleted. E8/E9 duties moved to MOS 81Z.

THE GAP

- **Photolithograph and Map Reproduction:**

MOS 83E (Platemaker) revised to include duties of MOS 83D (Process Photographer) which was deleted. MOS redesignated as Photo and Layout Specialist.

MOS 83F (Offset Pressman) — Incorporates duties and functions of MOS 83Z (Photolithography Chief) which was deleted. MOS 83Z E8/E9 duties moved to MOS 81Z MOS redesignated as photolithographer.

Organizational charts for all Engineer MOS have been published and are currently being distributed to all Engineer units, company level and above. These charts depict the soldiers progression from entry level to Command Sergeant Major on the front side and discuss the impact of EPMS on the soldier on the reverse. If your unit has not received copies of these charts by April 77, please contact: Commandant, US Army Engineer School, ATTN: ATSE-TD-IT, Ft. Belvoir, VA 22060.

TRIVIA

1. PUDDER'S LAW: Anything that begins well will end badly. (Note: The converse of Pudder's law is not true.)
2. FINAGLE'S LAWS: (1) Once a job is fouled up, anything done to improve it makes it worse.
   (2) No matter what results are expected someone is always willing to fake it.
   (3) No matter what the result someone is always eager to misinterpret it.
   (4) No matter what occurs, someone believes it happended according to his pet theory.
3. WELLER'S LAW: Nothing is impossible for the man who doesn't have to do the work.
4. RUDIN'S LAW: In a crises that forces a choice to be made among alternative courses of action, people tend to choose the worst possible course.
5. DOW'S LAW: In a heirarchical organization, the higher the level, the greater the confusion.
6. MURPHY'S LAWS: (1) If anything can go wrong, it will.
   (2) Nothing is as easy as it looks.
   (3) Everything takes longer than you think it will.
7. MENCKEN'S LAW: There is always an easy answer to every human problem—neat, plausible, and wrong.
8. GUMPERSON'S LAW: The probability of a given event occuring is inversely proportional to its desirability.
9. HARVARD LAW: Under the most carefully controlled conditions of pressure, temperature, volume, humidity, and other variables, the organism will do as it damn well pleases.
10. THYME'S LAW: Everything goes wrong at once.

Stop 16

Now that we have your attention, we need your support. STOP — 16 (letters to the editor) has almost stopped. Without your input and comments it is difficult to perceive what you would like to see in future editions of the magazine. We are interested in your likes, dislikes and general comments. We will take them in any style or format and on any material as long as it is legible. For a start, drop us a line and tell us about any innovative technique your unit has experimented with that would be benificial.

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Engineering

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The Engineer is an authorized quarterly publication of the U S Army Engineer School It is published to provide factual and in depth information of interest to all Engineer units. Articles, photographs and art work of general interest may be submitted for consideration to Editor, The Engineer, USA Engineer School, Fort Belvoir, Virginia 22060 Views and opinions expressed herein are not necessarily those of the Department of the Army. Use of funds for printing of this publication has been approved by Headquarters, Department of the Army, January 1, 1974.

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CHIEF'S BRIEFS

Brigadier General John Moulder Wilson was born October 8, 1837 in Washington, D.C. Upon graduation from the U.S. Military Academy on July 1, 1860 he was promoted Brevet Second Lieutenant of Artillery.

In July, 1862 Wilson transferred to the Corps of Topographical Engineers. He was awarded the Medal of Honor for most distinguished gallantry at Malvern Hill, Virginia in August, 1862. Wilson transferred to the Corps of Engineers in March, 1863.

During the Civil War Wilson received four brevets for gallantry. After the war his assignments included positions in rivers and harbors improvements, fortifications, and public buildings and monuments construction. From 1889 to 1893 Wilson was superintendent of the U.S Military Academy.

Before appointment as Chief of Engineers on February 1, 1897, Wilson served as Northeastern Division Engineer. While Chief of Engineeers he directed the Corps' activities in the war with Spain and ordered official adoption of the present seal of the Corps. He retired April 30, 1901.

General Wilson died in Washington on February 1, 1919.

JOHN M. DERVAN
Assistant Curator
U.S. Army Engineer Museum

THE ENGINEER

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.PIPELINE. PIPE

THE ARMY HAS A NAVY!

As surprising as it may seem the US Army has a "Navy" of more than 1300 vessels. They range from 27-foot bridge erection boats to 343-foot beach discharge lighters. By 1985 it is estimated that 85 percent of the Army's craft will have outlived their life expectancy. The Army, realizing the gravity of the situation, plans to replace the fleet during the 1980's. Meanwhile, it is up-dating what it has on hand.

As part of this effort, the US Army Mobility Equipment Research and Development Command (MERADCOM) at Ft. Belvoir, Va. is providing technical guidance on pilot modernization of a present Landing Craft Utility (LCU). Technical data developed as a result of this pilot modernization will form the basis for modernization of approximately 60 LCUs.

The pilot craft (LCU 1579) now under test at MERADCOM boasts new mechanical gear, pollution abatement equipment, new electrical system, navigational instruments, and advanced communication equipment.

Many of the LCU's in the fleet are equipped with engines procured during the 1950's. Replacement parts for the old engines became a gigantic supply problem. These old engines on the LCU 1579 prototype have been replaced with a diesel "Clean Air" engine.

Federal Water Pollution standards have come into being since the LCU fleet was commissioned. All commercial and military ships now must meet the Federal standards. The film or sheen left in a ship's wake can be prevented by using an oil bilge water separator. The separator developed by MERADCOM will allow oily water collected in the bilge to be discharged without affecting the environment.

Using minimum flush commodes, sewage is ground up and pumped into a holding tank and later transferred ashore.

The entire electrical system was switched over from direct current to alternating current used by most ships today.

A flying bridge cover was added to protect the ship's captain and his crew communication and bridge navigational gear. This replaces the makeshifts that soldier-sailors have boot-legged for years.

The Army used tube type radio sets which allowed them to communicate with other Army craft but not Navy or commercial ships. The new VHF/FM radio installed in the prototype LCU will be able to communicate with all other ships and ground troops. The old communication gear had a range of 50 miles. The UHF/FM radio can send and receive up to several hundred miles.

A new gyrocompass and radar system were adopted increasing the navigational capabilities of the LCU fleet.

The LCU 1579 upon leaving MERADCOM in February is scheduled for further test at Ft. Eustis, Va. to determine user acceptability of the modernized LCU craft.

200th ANNIVERSARY OF 1st ENGINEERING SCHOOL SET FOR 1978

On 9 June 1778, General George Washington issued the following General Order:

"Three Captains and nine Lieutenants are wanted to officer the Companies of Sappers: As this Corps will be a school of Engineering, it opens a Prospect to such Gentlemen as enter it and will pursue the necessary studies with diligence of becoming Engineers and rising to the Important Employments attached to that Profession, as the direction of fortified Places, & etc. The Qualifications required of the Candidates are that they be Natives and have a knowledge of the Mathematics and drawing or at least be disposed to apply themselves to those studies. They will give in their Names to Head-Quarters."

General Washington's call for engineer education at Valley Forge was the first step which eventually led to America's engineering pre-eminence in the industrial nations of the world. The observance of this date can serve to remind all Americans of the importance of engineering and engineering education in today's world.

On 9 June 1978, the 200th Anniversary of the founding of the first Engineering School in

LINE. PIPELINE.

America will be observed at Valley Forge, Pennsylvania. General Bruce C. Clarke, US Army Retired, is chairman of the planning group. This article is to serve as a warning order to "all Engineers" military and civilian. As the plans progress, information will be disseminated. Start making your plans now.

SYNTHETIC OILS STUDIED BY MERADCOM

Since a lubricant can "make or break" an engine, there is a continuing search for new and improved engine oils. One group of such products, synthetic oils, is under investigation at the US Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, Va. As indicated by a recent article in **Soldiers** magazine, many claims of superior service have been made about synthetic oils. At least a portion of the claims are valid.

Synthetic oils are less volatile (resist evaporation) and possess greater oxidation resistance at high temperatures. In addition, they exhibit excellent low-temperature flow characteristics and have "built-in" multiviscosity properties. Other claims such as increased drain intervals, improved fuel economy and reduced wear have yet to be substantiated. Not only is there a lack of data in these areas, but also the means to generate this information presents a problem. With the exception of actual field operation, current test techniques are designed for petroleum products and may not be satisfactory for predicting synthetic oil performance.

Also, economics must be considered from the point of fuel savings and product cost. Synthetics average four, and can be as much as seven, times more expensive than petroleum oils.

Another area of concern is the development of additive technology for synthetic engine oils. An investigation which has just been completed shows most of the commercially marketed products contain standard petroleum additive systems. This indicates that special systems have not been developed for synthetic oils. Synthetic engine oils are expected to play an increasing role in the lubrication of Army equipment. Although future oil specifications may not specifically require their use, the performance criteria will necessitate synthetic or hybrid (synthetic-petroleum) materials.

Synthetic oil is already being used as an engine lubricant in arctic regions. MERADCOM programs are specifically directed towards expanded applications for all season lubrication and extended oil drain intervals.

NEW TV TAPE AVAILABLE FROM USAES

The USAES has produced a new 26 minute color TV tape, titled "The Engineer System," 051-0191. The tape was produced for General Officer Designees to U. S. Army Active Divisions. The film will be shown at the Armor and Infantry Schools to all future Division and Assistant Division Commanders effective March 1977 at Fort Knox and Fort Benning. It contains an introduction and conclusion by General Johnson with a middle film account on the engineer mobility, countermobility and survivability missions to include a wrap-up of future systems being developed. Temporary loan copies are available from the Fort Belvoir TASC, Stop 16F, and permanent copies can be ordered by submitting a blank 30-minute ¾" tape, request by number and title to this agency, Fort Belvoir, VA 22060. Primarily designed for non-engineers it can be used for engineer audiences at the entry level to explain the combat engineer's mission.

Stop 16

NOTE: If you are a member of EOBC 13-56, please read the following article.

SIR:

Thank you for your sending the two diplomas for me. I just receive them today. I am broke now because all my property was sunken when I got onto the fishing boat and helped my children to escape by using the inner tubes as life rafts.

Would you please help me now to find out the address of our fellowship of 13 EOBC so I may ask them for some help while waiting here to go to the United States, or you may give me the photograph of my classmates took all together.

Thank you again for your prompt attention. May God bless you and your family.

TRAN-HIEU TRAI
VIETNAMESE
REFUGEE BOAC 3
SONGKHLA THAILAND

SIR:

Reference is made to Colonel Moellering's article in your November-December 1976 issue: "Something is Very Wrong" (pp. 9-10). I agree with the title, and I believe in its message: There is not enough realistic training. Too often the "problems of coping with actual (as opposed to refereed) problems" cause commanders to shelve that type of training to another day. Let's call those manana decisions what they are: a **training detente.**

I also believe the following passage from the January 1977 Airman magazine: (Ivan is preparing to 'survive you'. It matters not whether you believe it. The Communists believe it.") I have indicated three other places in that (first of three parts) article. The first two are the reason for this letter to you, the Engineers. The first is that the Soviets believe that they must be prepared to achieve total victory in war to include nuclear war. The second is that the Soviets are serious in their approach to Civil Defense. I believe that you have been lulled into forgetting the nuclear, Damocles sword as a result of the aforementioned **training detente**.

The third place that was marked, mentions "surprise". "The Soviets believe the use of surprise brings success in battle". I was surprised to see that the Airman magazine article did not mention the benefits the Soviets achieve in their realistic chemical warfare training. I was happy to see masks being carried in the picture in Colonel Moellering's article. I hope that his article, with your backing, can assist in avoiding an unwarranted surprise on the battlefield. Realistic training could help overcome the **chemical training detente.**

You not only provide engineering expertise on the battlefield but should keep poking the civilian communities into action. Where are your fallout shelters? Do you have one for duty hours when away from family and another for your family? Do you live on post and don't have one for the family? How can you go to work, talk, and train for war and then forget everything about the threat of war at quitting time? Is that the "good" of having a home and family — their ability to help you forget the nagging problem that war might cause? How about your doing some "good" for home and family and assisting in preparing them to survive if you are lucky enough to get to a battlefield? Or is it easier to have a **family (civil) preparedness detente?**

THOMAS P. STRIDER
LTC, USA (Ret)

TRAINING NOTES

SQT IS PERFORMANCE TEST

Soldiers preparing for the new Skill Qualification Test (SQT) shouldn't just study, they should also practice. The theory behind the new testing system is performance. Instead of just knowing what to do, soldiers demonstrate that they can do it.

According to TRADOC, soldiers who practice their skills — and can perform them well enough to do the job — should have no difficulty passing the SQT. In fact, if you want to know the questions and look at the answers on the SQT, it's simple. Get your copy of the Soldier's Manual and test yourself.

If you are in one of the following MOSs you should already have a copy of your Soldier's Manual: MOS 11B, 11C, 11D, 11E, 16B, 16C, 16D, 16H, 16J, 16P, 16R, 95B, 95C, 95D, 76J, 34E, 34F, 34G, 41C, 44E, 45B, 45K, 45L, 63C, 63G, 63H, 63J and 71P. If you don't have your manual, tell your immediate supervisor. For soldiers in other MOSs, manuals are being developed and will be distributed when completed.

The Soldier's Manual is the most important book you own to help you do a better job and to pass the SQT. The manuals can also be used as a refresher for skills taught in basic training, AIT, or schools. The Soldier's Manual can be used to brush up on basic soldier skills.

In addition, the Soldier's Manual also lists all the critical tasks required to perform your job. Remember, if it isn't in the manual, it won't be on the SQT. Some soldiers believe the SQT will have some "trick" questions, but this isn't so. Every question will have a direct practical application to your job. If you need certain tools on the job to perform the task, you'll have them (or simulation devices) during your SQT. The three components of SQT — hands-on, written and performance certification — may be included. That is, certain SQT may have one, two, or all three components, depending on the job.

The following MOSs are scheduled to be tested within the six month periods as indicated below.

(W—written component; P—performance certification; H—hands-on component; SL—skill level).

APRIL—SEPTEMBER

MOS	SL1	SL2	SL3	SL4
11B	WPH	WPH	WPH	
11C	WPH	WPH	WPH	
11D	WPH	WPH	WPH	
11E	WPH	WPH	WPH	

JULY—DECEMBER

MOS	SL1	SL2	SL3	SL4
16B	WPH	WPH		
16C	WPH			
16D	WPH	WPH	WP	
16E	WPH	WPH	WP	
16H	WP			
16J	WPH	WPH	WP	
16P	WPH	WPH	WPH	
16R	WPH	WPH	WPH	
95B	WPH	WPH	WP	WP
95C	W	W	W	W
95D	WP	WP	WP	WP

Results of your SQT will be given to you, your commander and to U.S. Army Military Personnel Center. MILPERCEN will use the scores for career management and promotion purposes.

TACTICAL PROBLEM

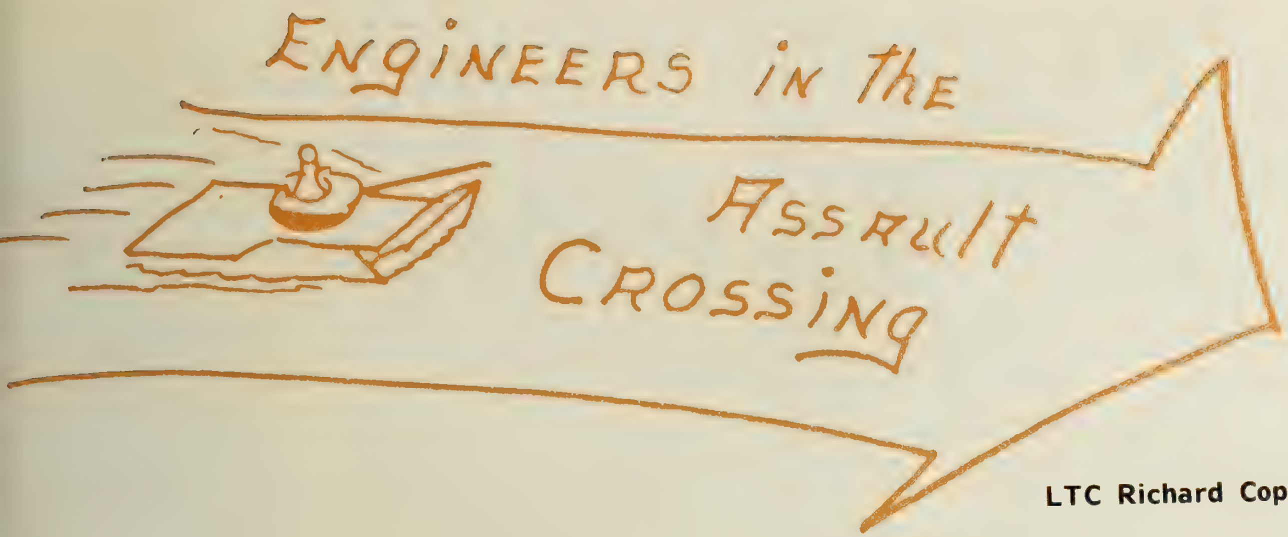
SITUATION: In a simulated test of the tactical effectiveness of minefields in the anti-tank weapons's system, the results in the chart below were obtained. The defender was a Mechanized Infantry Platoon, the attacker a 15 tank opposing force company. The minefield density has .002 mines per square meter and scatterable anti-tank mines used on the surface of the ground.

TEST	TANK LOSSES	
	NUMBER	PERCENTAGE
Minefield Alone	3	20%
Anti-Tank Weapons's Alone	5	33%
Both Minefield & Anti-Tank Weapons:		
Minefield Kills —	4	27%
AT Weapon Kills —	6	40%

PROBLEM: What is the synergistic effect of the minefield to the anti-tank weapons system? What is the combat multiplier of the minefield to the anti-tank weapon's system?

Continued On Page 24

ENGINEERS IN THE ASSAULT CROSSING



LTC Richard Copeland

In 1972 the author was Chief of the Tactical Bridging Branch at the Engineer School. Asked by the Canadian Liaison Officer at MERADCOM (MERDC) to explain the US doctrine for engineer support to amphibious vehicles during the crossing of a water obstacle, he discovered that the US has no doctrine. No US manual defines the who, what, when and how of the engineer mission to aid amphibians. Subsequent research uncovered some rather startling facts.

In our modern, mobile Army the way to get across a river during an assault crossing, is to swim across in our Armored Personnel Carriers (APCs)! The M113A1 APC is a fine swimmer! Numerous exit sites with gentle slopes exist along most rivers! When the Mechanized Infantry Combat Vehicle (MICV) is fielded we will see it speed across rivers and roar up over the far bank! Right?

Don't bet on it! When you compare the stream crossing capability of the MICV to the actual terrain in which it will be employed, it may be a worse amphibian than the M113. An amphibian must be able to propel itself through the water and power itself up and out of the water at the far bank. With its water propulsion kit, the MICV could have negotiated currents up to 9 fps and surmounted a far bank with a fairly steep slope. The Army has dropped the requirement for the propulsion kit. Although the MICV may be a better swimmer than the M113, it will be twice as hard to get up over the far bank!

The mission or problem of getting amphibians up over the far bank is the job of the combat engineers.

An amphibian's ability to cross a water obstacle is a function of:

- Stream conditions — primarily the current.
- Bank conditions — especially the far bank.

The two conditions are interrelated. Let us assume for this article that amphibians will get across the river unaided. The second condition brings the engineers into the act. Perhaps that statement should be rephrased—this is where the maneuver commander expects the engineers to come into the act!

For example, in Field Manuals (FM's) 5-135, 17-1 and 31-60, it is specified that: The divisional engineers have the primary mission of supporting the assault units during the assault phase by breaching obstacles, operating assault boats, preparing entrances and exits for vehicles, and aiding fording and swimming vehicles. If supporting personnel are not immediately available, it may be necessary to change the order of crossing or select a different crossing site.

FM 17-1 views pessemistically the ability of the engineers to enhance friendly mobility,

> Poor banks can often be improved by use of pioneer tools or dozers and corduroying (laying logs). Track pads should be removed in order to provide better traction. It is seldom possible to improve banks on the far side of the stream.

The problem was recognized in the USADC Engineer Agency Study, ENGINEER-75 which admitted that,

> More effort must be expended in the reconnaissance of fords, improving bottom conditions, and providing aids to tactical vehicles for entry and exit for wet and dry gaps . . . The current M113, or its followup vehicle, has a swimming capacity in moderate currents but experiences difficulty in entering and exiting wet gaps having steep sloped banks.

The 1964 Armor Agency Study defines the existing constraint very clearly.

VEHICLE STREAM CROSSING CAPABILITIES

VEHICLE						STREAM CROSSING CAPABILITY	
TYPE	NOMENCLATURE	HP	WGT (Tons)	HP/ TON	(PSI) GND PRES	SPEED IN WATER	EXITING CAPABILITIES
APC's	FV 432 (BR)	240	15.1	15.7	11.1	Tracks — 5.6 fps	Approx 15% bank slope
	M113 (A1) (US)	215	12.3	17.5	7.6	Tracks — 5.6 fps	Approx 30% bank slope (25% if clay or loam)
MICV's	MICV (US)	450	22.7	19.8	7.1	Tracks only — 7.2 fps With propulsion kit—9.0 fps	50% bank slope required. 50% bank slope desirable
	AMX 10P (FR)	276	13.8	19.7	8.0	Tracks only — 5.9 fps With propulsion kit — 7.2 fps	Not specified
	MARDER (GE)	600	31.0	19.0	11.0	Tracks only* — unknown	Not specified
ENGINEER SUPPORT VEHICLE	UET (US)	285	16.0	17.8	8.3	Tracks only — 4.5 fps	Not specified
	CET (BR)	320	17.1	19.0	6.25	Waterjets — 8.2 fps	40% bank slope unaided
	ENFRAC (FR)	550	30.0	18.1	8.6	Waterjets — 9.2 fps	Vertical bank

* The MARDER can swim only with a floatation kit. The MARDER can ford a 2 meter stream (with fording kit carried on vehicle).

TABLE 1

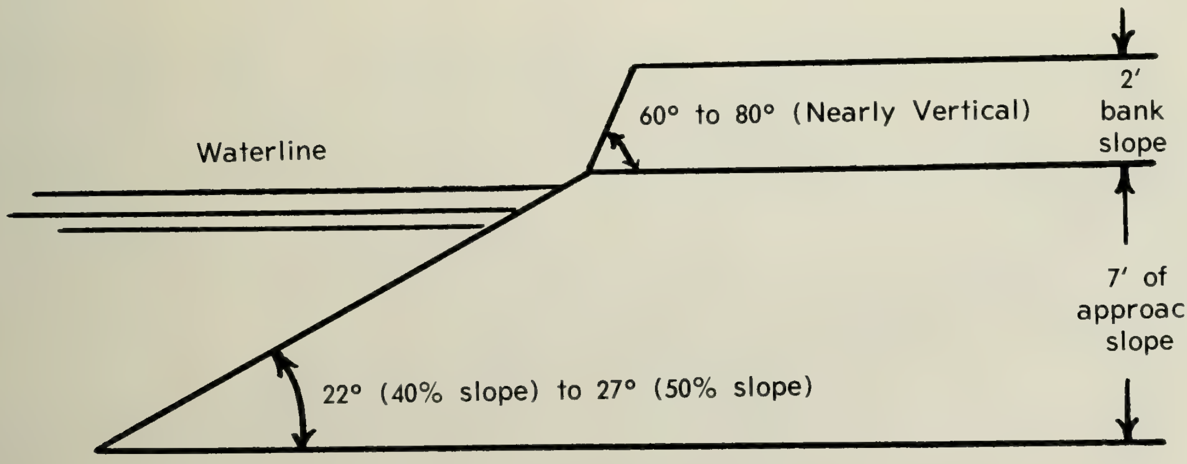
Since the successful completion of mission and seizure of an objective will in many cases depend on a successful stream crossing, the factors effecting the vehicles' stream crossing capabilities must be considered. In view of the swimming and deep fording capabilities of the vehicles organic to Armor and Armored Cavalry units, these factors are determined to be:

- Stream width
- Stream depth
- Water velocity
- Bank height
- Bank slope
- Trafficability
- Stability of stream bottom
- Enemy action
- Weather

When these factors were analyzed, based on experience with swimming and fording vehicles and discounting enemy action, it was found that the determing factors affecting stream-crossing capabilities for both swimming and fording vehicles in most operations, are the slope and trafficability of the banks and condition of soil adjacent thereto. Additional determining factors are: tracked vehicles—depth of water; swimming vehicles—stream velocity . . . It may be generally stated, however, that few locations which have not been specifically prepared will allow armor vehicles to enter and exit from the water with the desired ease and speed . . . Expedient means of getting the vehicles out of the water must be accomplished with dispatch to reduce vulnerability and exposure time to enemy fire. Elimination of underwater demolitions and obstacles will remain a task of Engineer troops.

The exiting problem was also outlined succintly in an article written by a British Officer in Military Review in 1963,

> Nevertheless, the fact that a vehicle can float does not mean that it can cross rivers without assistance. Such vehicles will always encounter difficulties in getting in and out unassisted, of any river but one with gently sloping banks. Such rivers are rare, particularly in highly developed countries where they may be canalized. In any event there are likely to be only a very few places where unassisted crossing is possible. Even when such crossing sites exist,


Waterline
60° to 80° (Nearly Vertical)
2′ bank slope
7′ of approach slope
22° (40% slope) to 27° (50% slope)

Soil Conditions:

C = 0 to 0.5 psi
O = 35° to 25°
C.I. = 80 to 120

BANK SLOPE PROFILE

FIGURE 1

> the large volume of water brought out of the river by the amphibians as they emerge is likely to make them unusable in short order.

The article presumes that the problem will be overcome through engineer support, stating,

> Considerable development effort is going into overcoming this inherent weakness of amphibians, but there is no doubt that earthbound vehicles will always require considerable engineer assistance in the assault crossing of normal European rivers.

The problem definition and possible solution appeared in Armor in 1973,

> But the river crossing problem is more than speed. If a major factor in mobility is speed, then it must be overall speed in many enviroments. What good is a high speed amphibian if it cannot exit on the other side? Perhaps the most significant increases in river crossing performance will come from improved exiting techniques. These exiting improvements may come from increased thrust in the propulsors (for we know already that good water thrust materially aids exiting). They may also come from improved vehicle traction components. Some feel we must develop improved winching techniques. But the greatest promise, at present, appears to be in a radical change in vehicle configuration. Perhaps we should develop a river crossing "pioneer" vehicle. This vehicle, with the most advanced river exiting aids, would proceed the main force, exit and provide assistance to following elements by towing them up the bank or by excavating the bank to create a formidable obstacle.

As shown in Table I, the M113 APC can climb a 30% riverbank slope. The M113 can therefore surmount approximately 15% of the riverbanks of Western Europe. If the far bank happens to be clay or loam, as are 50% of the riverbanks of Western Europe, the M113 has about a 10% chance of making it over the far bank.

The required capability of an amphibian to surmount an exit slope is rarely specified. In the case of the MICV the required capability is defined as a 40% slope with 50% capability desired (figure 1). If the 50% capability can be achieved the MICV will be able to surmount approximately 40% of the riverbanks in Western Europe. If the MICV attains the more likely 40% capability, the vehicle will be able to surmount, unaided, only 30% of the banks. The constraint is more severe in Western Europe than in most other areas of the world due to the extensive canal construction which has been accomplished.

In any area of the world the exit is a very difficult operation, as described in FM 17-1.

> When exiting from the water, the vehicle should start up the bank at a constant speed never allowing excessive track slippage. Once traction is lost the tracks will dig in and the vehicle will stall or the vehicle will slide in the water.

FM 7-10 warns that we must,

> Approach the land squarely, Approach the land at reduced speed (approximately 3 kmph).

The Armor Agency Study concluded that,

> Closely related to the problem of negotiating a river bank at a given height, is the actual degree of slope in contact with the track of the vehicle and the nature of the soil. An unassisted exit by a swimming vehicle from a stream with a wet, muddy bank, with any appreciable slope is not probable, without prior bank preparation.

The studies have found that, within reason, the height of the bank step (Fig 1) is not the governing constraint. Once the vehicle gains traction on the bank slope, it should be successful in surmounting the bank step. It should be recognized, however, that 60% of the bank steps in Western Europe are greater than the 2 foot step shown in Figure 1.

The British Army conducted trails in 1962 and 1963 to determine specific aids to amphibians. The tests used Class 30 trackway, rocket propelled grapnels, hand placed anchors and JATO type rockets for thrust.

Further trials were conducted by the British Army of the Rhine in 1971-72. The trials resulted in the adoption of the following aids to amphibians:

- Applique Propellor
- Hub Winches and Hand-Emplaced Anchors
- Rocket Propelled Anchor
- Trackway
- Fixed Line Equipment

The applique propellor is a waterwheel-type device attached to the drive sprockets of the vehicle. The limited thrust provided by applique propellors is insufficient to propel the MICV over most banks.

To date, hand-emplaced anchors have not been able to develop sufficient holding power to permit a MICV winchout. The MICV is heavier than the British FV 432 and the M113 (Table I). The rocket propelled anchor system or any "holdfast" installed on the bank would require the use of a winch on the MICV.

The current US Army engineer capabilities are unimpressive. The following methods are currently available to aid the existing of amphibians:

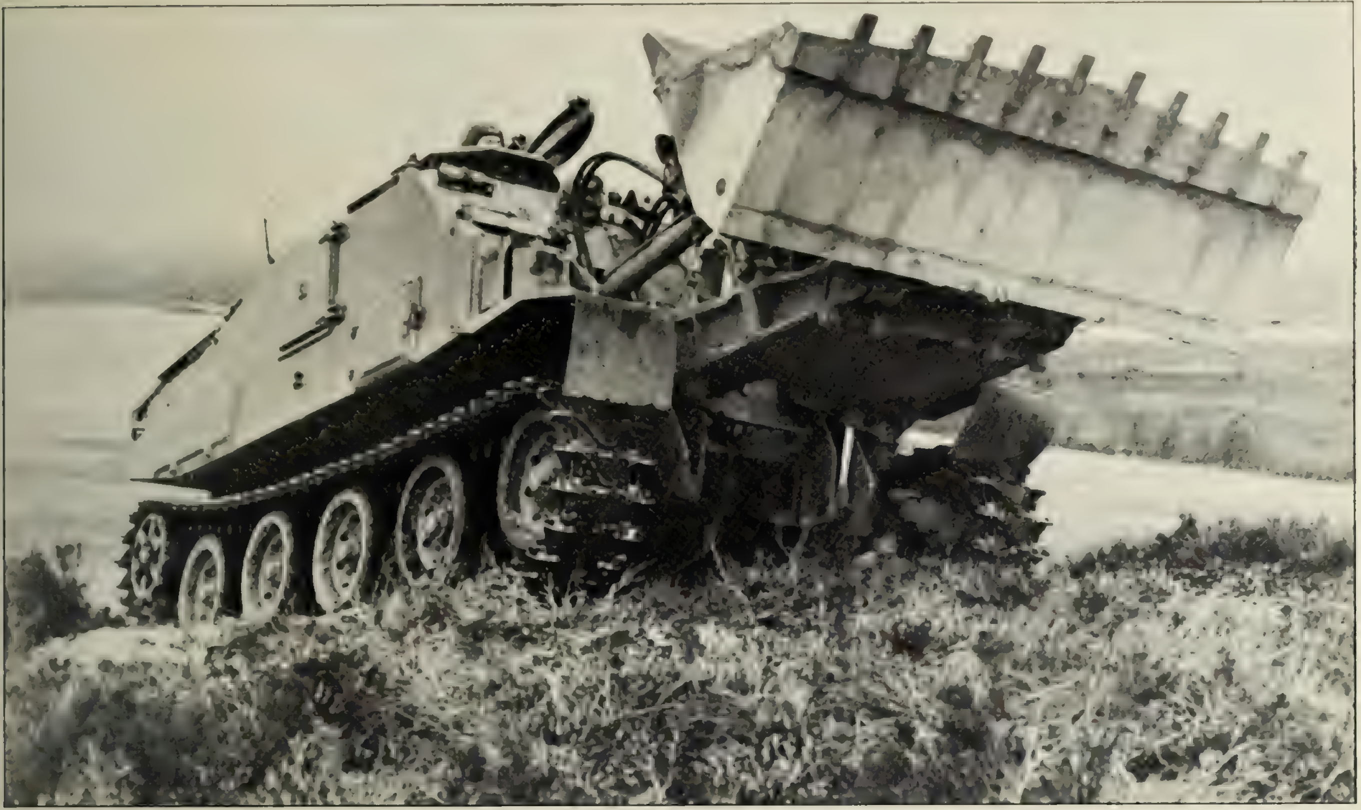


FIGURE 2

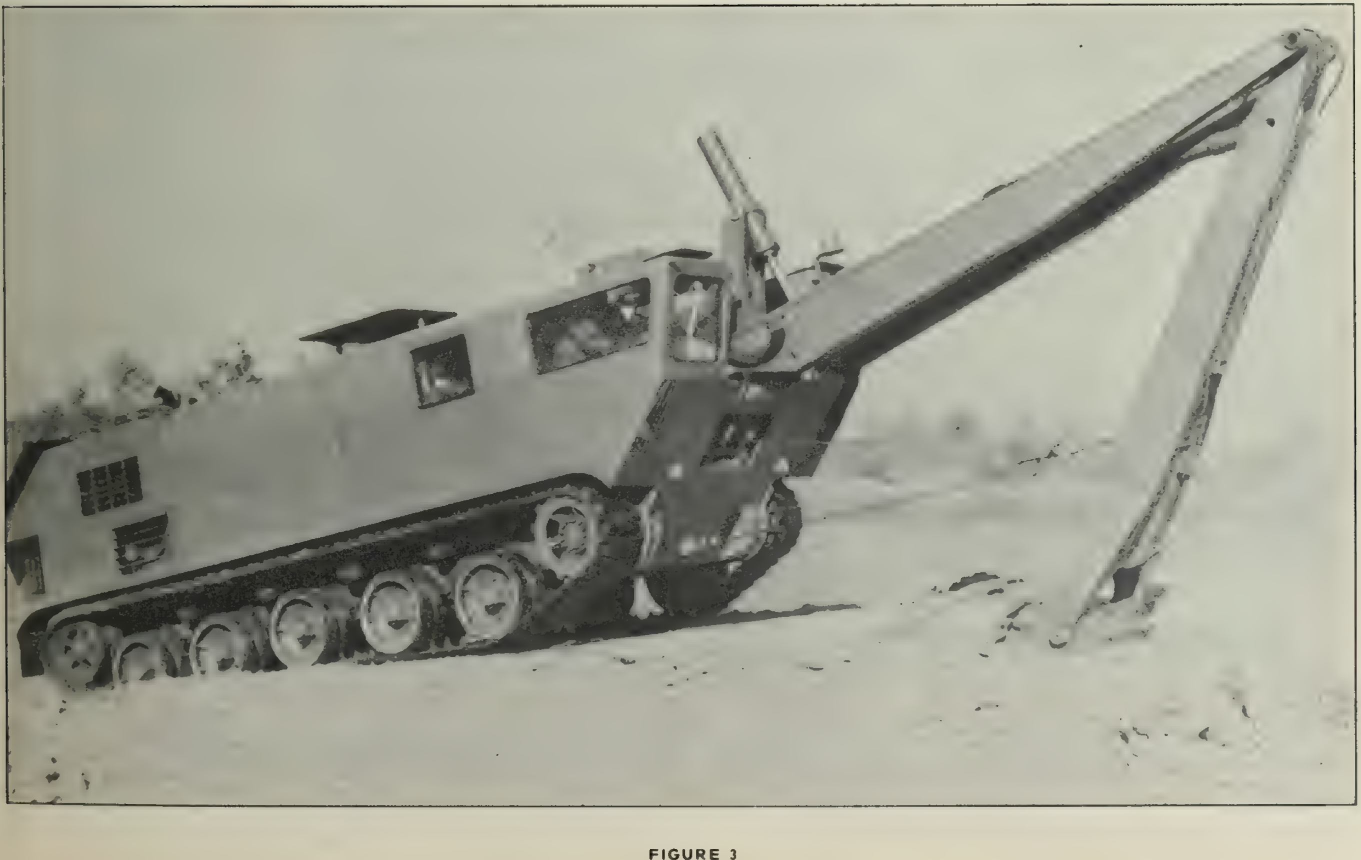


FIGURE 3

- Transport engineers to the far bank on an APC/MICV/assault boat. There, using pioneer tools, reduce the exit bank slope. This method is inordinately time consuming.

- Transport engineers and log deadman to the far bank. Using pioneer tools, excavate for and install the "log deadman" anchorage. This method is enormously time consuming and assumes a winching capability on the exiting vehicle.

- Transport engineers and chain-picket holdfasts to the far bank. Install the chain-picket holdfasts. This method is time consuming, but not nearly as much as the above methods. The method assumes a winching capability on the exiting vehicle. An alternative would be to install a ground-mounted powered capstan winch on the far bank but none exist with more than a two ton pull.

- Helilift an airmobile tractor to the far bank. The tractor would either:

  — Reduce the exit bank slope.
  — Excavate for a "log deadman".
  — Act as a "light" deadman.

Reducing the exit bank slope or installing a log deadman using the tractor is less time consuming than using pioneer tools. If in the unlikely case that testing determines that the tractor has sufficient "deadman" capacity to hold an exiting MICV, a winch could be mounted on the tractor. This method presupposes that:

— The airmobile tractor, organic only to airmobile units, will be available for the mission.

— Cargo helicopters will be deployed in the vicinity of the line of contact.

— The weather will permit the flying mission.

Engineers could provide adequate assistance to amphibians if provided with the following equipment:

- A modified Universal Engineer Tractor (UET). The UET could be outfitted with the rocket propelled anchor. Once on the far bank, the UET would be able to take on soil ballast in order to be able to act as a deadman or to winch out amphibians (12.5 ton winch). The UET would have to be modified, perhaps unrealistically, in order to be able to negotiate high river currents and exit steep banks.

- The Combat Engineer Tractor (CET) (Fig. 2). The CET, being developed by the British Army, has the following characteristics:

— As an amphibious vehicle, propelled by two powerful rear mounted water jet units, it can maneuver with accuracy in high currents.

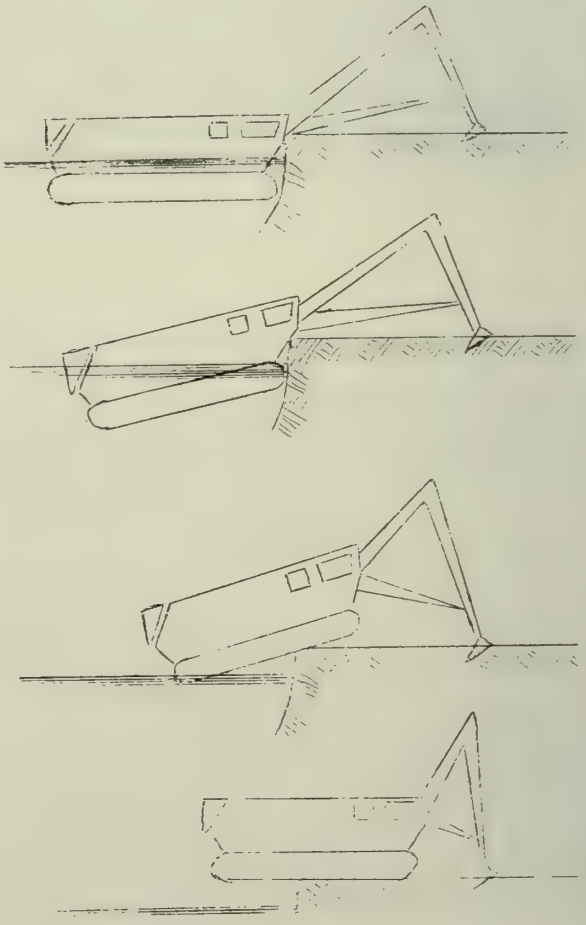
— Exceptional cross-country mobility and is able to exit unaided on all but the most difficult sites. The rocket propelled anchor, a standard part of the vehicles' equipment, adds to the vehicles own considerable exit potential.

— An 8 ton winch can be used to help other vehicles to exit.

— Good earthmoving performance which can be used to improve the exit banks.

— The ability to carry and lay Class 60 Trackway.

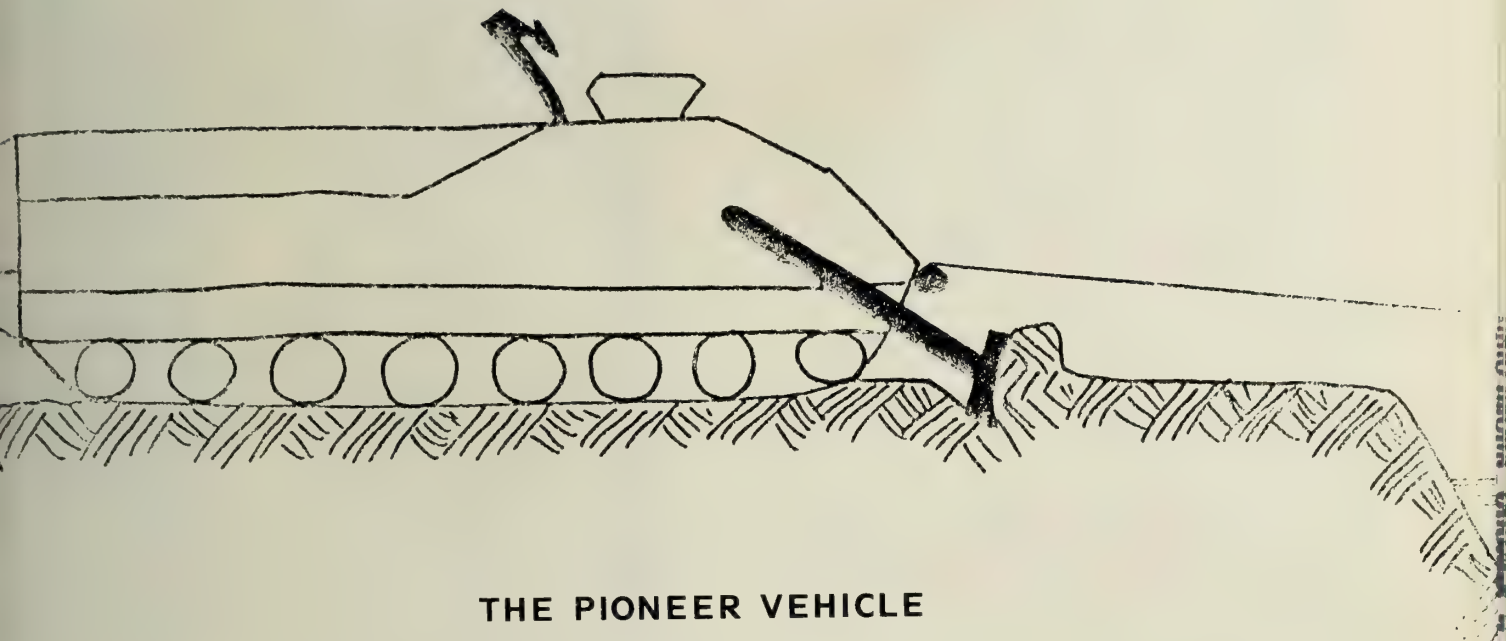
- The Engin D'Aide Au Enfranchissment (ENFRAC) (Fig. 3). The ENFRAC, being developed by the French Army, is an engineer amphibious tracked vehicle and has been designed solely to solve the far bank problem. The vehicle



The ENFRAC

Exiting A Vertical Bank

FIGURE 4



THE PIONEER VEHICLE

FIGURE 5

has the following capabilities:

— Earthmoving (to reduce the exit bank slope).

— Winching.

— Road obstacle clearing.

— Transport for engineer teams.

The vehicle self-exits the far bank (Fig. 4) using its "anchorizing foldable arm." The ENFRAC mounts a "4 in 1" scoop loader.

- The Pioneer Vehicle — an M723 with propulsion kit and rocket-propelled anchor (Fig. 5).

— Provide divisional engineer squads the MICV (M723) chassis (minus the weapons turret) with propulsion kit permanently installed.

— Each Pioneer vehicle would mount a rocket-propelled anchor. Additionally the vehicle would mount a winch under the splashboard.

— In order to ensure that the Pioneer vehicle can hold fast while winching out MICVs, it may be necessary to mount a dozer blade on the front.

In summation, the exit conditions at streambanks (i.e., slope, bank step height, soil conditions, etc.) of streams in Western Europe are documented. The required exiting capability of the MICV will enable the vehicle to exit, unaided, only 30% of the streambanks of Western Europe. The exiting constraint to amphibians can be overcome by the use of external aids and those aids currently available in the US Army do not adequately meet the required operational capability.

Items of equipment are under development which meet the required operational capability. Thus if the US Army is serious about conducting the assault river crossing with APCs/MICVs, we have a serious capability gap. Will the US Army Engineers take the initiative to fill this gap? LET US TRY.

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That Extra Effort

The old Cavalry spirit rides high in the 1st Cavalry Division (FIRST TEAM)! As the Division Engineers for the FIRST TEAM, some of that extra effort required by the Cavalry spirit rubbed off on the 8th Engineer Battalion (Skybeavers). The primary mission of the FIRST TEAM is to be able to go any where, anytime and win the first battle. To achieve this goal, considerable training is required. This training can be ordinary or it can be spiced with many activities that not only results in a combat ready unit . . . but is fun also!

Over the past few years, the FIRST TEAM ENGINEERS have developed a training program that has three component parts. Technical Engineer training from ARTEP's is combined with support to maneuver units in ARTEP training, and a heavy construction program. These three types of training consume about 60% of the available effort with the remaining 40% split between maintenance, housekeeping details and support to other non-divisional units and schools.

The most important item in training management is the thread that ties it all together. The FIRST TEAM ENGINEERS weave a program that challenges both the trainers and the trainees to perform at high standards. The annual program includes all unit levels of ARTEP tasks. The SQT is not yet available for the 12B series, but the 11E and 11B and 12B draft SQT's are used in individual training conducted by the NCO's of the battalion. The thread that ties the ARTEP training together is the number of projects that can be funded. The number of timber trestle bridges, bunkers, culverts, revetments and other items are managed to insure that each unit gets equal challenges in completing them. Other items included in the training program are Spouse Day, NCO Responsibility Day, Officer Training Day, New-Comers Day, Dining-Ins, Monthly Battalion Award Parades, Professionalism Seminars for NCO's, Personal Effectiveness Training for Leaders, Hot Shot Squad competitions, SERE Training, and dynamic movement training that includes actual air movement.

Programmed throughout the cycle are all the weapons and demolition ranges. Pride is taken in the volume and frequency of our support of the maneuver battalion ARTEP's. Operator training on the full spectrum of our equipment provides operators with both maintenance and driving training. Civic action includes support to Boy Scouts, Girl Scouts and local agencies. Meshed with the foregoing tactical training are many construction projects. Last year $390,000 of construction benefitted both the FIRST TEAM and Fort Hood.

All of these events will be more fully described in the remainder of the article. This full training program did just not happen . . . it was the result of considerable planning and coordination. Any unit can conduct a similar program if they sit down NOW and block out the events to happen over the next six months. The planning within the battalion is reasonably firm six months hence. Thus the events described in this article are planned and repeated, with new touches added, on a six month cycle.

Hopefully, these examples will provides some ideas for commanders to use when providing guidance to their staffs on training programs.

ARTEP TRAINING

The climax of the training cycle is the annual battalion level ARTEP. Two different methods of achieving this goal have been tried. A multi-level system of doing squad, platoon and company level ARTEP tasks combined with SQT tasks has been tried, with all conducted concurrently throughout the year. The other method (cyclic training) uses a progression of squad to platoon to company to battalion level ARTEP tasks. Ideally the multi-level method should work best. However, the best method for our unit turned out to be the cyclic method because of the personnel turbulence and junior leader shortage problems. In the cyclic training cycle, the year is divided roughly into quarters. During the first quarter, the training focuses on squad level ARTEP tasks, the second quarter on platoon level tasks, the third quarter on company level tasks, and the final quarter is on battalion level tasks. Each quarter builds on the previous quarter so that, for instance, platoon and squad tasks are included with the company tasks during the third quarter. The thread tying the training together is construction projects which provide visible evidence of having achieved unit and individual proficiency. During the annual cycle, each platoon gets the opportunity to build a timber trestle bridge, bunker, timber loading platform, several culverts, helicopter revetment or other large construction training projects. All of these construction items are financed thru the training budget and not by the Director of Facilities Engineering at Fort Hood. Because they are training facilities, they can be destroyed by demolition or other expedient methods in training. For instance, of the seven multi-span timber

trestle bridges built in past year and a half, five have been blown by demolition. The others are scheduled for demolition on the coming ARTEP cycle.

Each level of ARTEP training is concluded with a test using ARTEP guidelines to insure the battalion commander that the companies have indeed met their standards. The Engineer Military Stakes are conducted at the conclusion of the squad training quarter. This is a round robin event with fourteen stations that test the proficiency of all squads in the battalion. The test takes three days and the squad bivouacs at the event locations while-being tested. All squads are evaluated concurrently so there is no opportunity to compare notes between squad leaders. The competitive spirit is enhanced by making intermediate results available so the squads can compare their overall standings. The best squad in each event is recognized as well as the best overall squad.

Platoon tests signal the conclusion of the platoon training cycle. This event is conducted in a three day period during which each platoon goes thru nine ARTEP events. The last test includes a hasty protective minefield, a light tactical raft (LTR) construction, a bridge demolition, ginpole and boom derrick construction, an infantry platoon assault, a field fortification exercise, a maintenance event and a communication event. The competition challenges the participants to excell. The best platoon for each event, and for all was selected and recognized.

The Skybeavers support all the other ARTEP's in the Division. Maneuver units have one or two engineer platoons supporting their ARTEP. Often engineers are used with the opposing forces (OPFOR) to provide a better challenge for the "friendly" engineers. Artillery units include a river crossing operation using mobile assault bridges (MAB's) during their ARTEP's.

ROLL OUT EXERCISES

To retain the keen readiness edge required for combat employment, frequent Emergency Deployment Readiness Exercises (EDRE) are conducted. These have ranged from simple alerts to full scale aerial movements.

One roll-out began at 0200 hours with the alert notification. At 0430 hours the Battalion assembled and moved out with their vehicles from the motor pool. After a trip around a predetermined route, all platoons received missions. Two platoons relocated to a C5A and actually combat loaded their equipment including a CEV. Eight other platoons were heli-lifted to a field location and required to hike back to the cantonment area. Another platoon received a mission to tear down an old building while two other platoons went thru the POR processing set up by the Battalion PAC section.

Another EDRE required all companies to static load a C5A and C141 per their loading plans, and to load C-130's and make a combat landing on a nearby assault strip. The troopers really enjoyed the opportunity to fly with their equipment.

Needless to say, for a battalion to undertake such complex coordination to make these exercises a success requires considerable lead time and fairly stable training plans.

HOT SHOT SQUAD

One training event that combines both ARTEP tasks and physical training is the HOT SHOT SQUAD competition. It is conducted during the squad and platoon portion of the cycle, about once a quarter. This competition consists of having all thirty-six squads compete simultaneously doing the same identical engineer tasks while racing against each other for both time and quality of construction. There are usually five events in the two hour competition. Some of the events have included assembly of CMP culvert, constructing batten boards, building a machine gun emplacement, building a knife rest gate, building a ginpole, filling sandbags and running with them, building an expedient antenna and entering a communications net, sawing railroad ties into several sections and similar type events that require a minimum of quality control yet can be done in a competitive spirit. At the end of the afternoon, the squads know pretty well of their weak areas in organization and planning. They have really tried hard to win the event . . . and had fun doing it.

SPOUSE DAY

Each six months, the FIRST TEAM ENGINEERS have a spouse day. The wives and children are invited to share a day with their husband. One Spouse Day was spent in a tour of the battalion facilities, motor pool, billets and a welcome by the Battalion Commander.

Another Spouse Day included a demonstration of an Engineer Company at work supported by the Heavy Equipment Platoon, a rappeling demonstration and a fire power demonstration of all weapons organic to the battalion. The third Spouse Day was a deliberate river crossing of a company using MAB's, swimming their APC's and supported by

the demolition of obstacles on the far shore. All of these events were more than s Spouse Day . . . they were good training that was real and different for all those involved. All were conducted in a three to four hour time span so mothers could be home when their school age children returned from school. All of these events had attendance of over 60% of the battalion wives . . . a good attendance.

SERE TRAINING

Survival, evasion, resistance and escape training is an excellent opportunity to test the individual training of the trooper. In this two day training event, the soldier was given intensified survival, escape and evasion classes. For the evening meal, a live rabbit and some vegetables were turned into engineer stew for each five man team. After the evening meal, the company was air assaulted to an objective, were surrounded and had to evade for a distance of twelve kilometers to their rally point. The area was infested with the scout platoons from the maneuver battalions. When an engineer was caught, he was taken to a POW compound manned by the Military Police and interrogators from the Military Intelligence Company. After sufficient interrogation, the engineers were given the opportunity to escape and continue their evasion to the rally point. This was well received by all even those picked up lost going in the wrong direction.

NCO RESPONSIBILITY DAY/OFFICERS TRAINING DAY

One day, the officers did not come to work. Rather, the NCO's took over and ran the battalion. The officers began the day with an early breakfast, then had the opportunity to attend a class on operating engineer equipment such as the CEV's, APC's, graders, cranes, and bulldozers. After a C-Ration lunch, the officers then rappeled, shot pistols and were airlifted to a lake where they had the opportunity to actually operate the Mobile Assault Bridges.

Another such day saw the Officers conducting a river crossing operation in the Fort Hood Battle Simulation Center using terrain boards, and several of the same wargames used by the maneuver units in their training.

ADVENTURE TRAINING

The day to day humdrum of activities can get even those involved in a high pitched training program down. To provide the change of pace, several activities have been tested. The AVLB platoon took a week trip down the Colorado River in rubber assault boats. Another company took a week hiking/rafting trip thru a National Park. They also returned four months later to build rustic bridges using native timber. Another unit boated on a large nearby lake. All adventure training provides a challenge for the staff to get it all coordinated; however, the benefits received, make adventure training a worthwhile change of pace.

CONSTRUCTION

Another important facet of training is construction. In FY 76, over $390,000 of construction projects were financed by the Director of Facilities Engineering for the physical enrichment of the FIRST TEAM and Fort Hood. The battalion's goal is to have one major construction project per platoon underway at all times. This provides the platoon leader with an alternative to field training. By accepting post level projects which have no completion date specified, the platoon leader can grapple with the conflicting priorities and determine what his platoon will do, training or a construction project.

Construction projects are not all work either. One project required six wooden tent floors and frames to be built. Rather than doing them successively, a contest was organized. One day, six platoons assembled around a pile of lumber and when given the signal, began construction. Ten hours later, the first of these tent floors and frames were completed. The structures were scored for both quality as well as speed. Similar ideas have been used on other projects. So . . . construction can also be training . . . and fun to do.

INDIVIDUAL TRAINING

Not all of the individual training conducted can be discussed in this limited article. Several key individual training programs should, however, be discussed.

To insure the maintenance is kept at a high level, a semi-annual cycle of operator training is conducted. This training last two to three days and is conducted for each of the fifteen types of vehicles and equipment in the battalion.

Officers attend a 45 minute class each week to hone their skills in various subjects as well as to practice giving classes and learning proper methods of instruction. The Chaplain conducts eight three-day sessions of Personnel Effectiveness Training (PET) for NCO's each year. Twice a year, the Battalion Commander conducts a daylong

Professionalism Seminar for all NCO's to refresh their leadership skills. When the new FM 5-34 was issued, several hundred copies were obtained and a two hundred question open book test was given to all NCO's and officers. Physical training is not neglected either. A program of daily PT coupled with a two hour A & R program, once a week, insures physical readiness.

The range program includes both familiarization and qualification on all weapons not only during the day but at night and in protective masks. Fort Hood has a Musketry Program for infantry units that begins at the squad level and progresses thru a company team of a mechanized infantry company, a tank platoon and COBRA-TOW support. To insure the Skybeaver's can perform the secondary mission of fighting as infantry, the battalion has completed the squad portions of the Musketry program. Over the coming year, the battalion will progress thru the program to hopefully achieve the ability to serve as a mechanized infantry company.

AWARDS CEREMONY

The start of each month is greeted with a Battalion parade called the Awards Ceremony. A scoring system is used to evaluate the companies in the area of communication, safety, maintenance, supply, best areas, most Espirit-de-Corps, security, administration and the best overall company for the month. The scoring criteria is arranged so that all subjects in an area of interest receive emphasis during the year. Thus when AGI/ORI time comes, each area has been thoroughly inspected and corrected. Plaques are awarded to the unit commander. Also, individuals are recognized with letters of appreciation, certificates of achievement. Army Medals, certificates for maximum score on the PCPT test and the best driver and mechanic for the month. The formation also provided the Battalion Commander with the opportunity to recognize the outstanding and not so outstanding events of the previous month and set the tone for the coming key events.

CONCLUSION

Hopefully, some of the ideas and concepts in this article that have been helpful to the FIRST TEAM ENGINEERS could also be helpful to other units that are looking for activities that will provide a real sense of accomplishment, achievement and participation on the part of all unit members. Other ideas and comments from other units that have been successful could be beneficially shared in such a format as the ENGINEER provides. Usually, ideas such as these have to be "reinvented" with each succeeding command group because no consolidated source of these dynamic training ideas is collected and made available to other units.

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Previous assignments have included tours with the Engineer Studies Group, OCE and the Engineer Command-Vietnam. He has also served as platoon leader and company commander in both Construction and Combat Engineer Battalions.

MAJ Campbell received a B.S. degree from South Dakota School of Mines and a Masters degree from Texas A & M University. He is also a graduate of the Engineer Officer Advanced Course, Command and General Staff College and is a Registered Professional Engineer. Several of his other articles have been published in Infantry, Military Engineering *and* The Engineer.

Fish Story

Two weeks after last summer's flood waters had subsided to within the banks of the Big Thompson River, members of the U.S. Army Corps of Engineers Emergency Disaster Team discovered an unsuspected tragedy.

About 20 feet from where the Big Thompson was now gently flowing, stood an isolated pool — a remnant of heady flood waters. This shallow pool, about three picnic tables in size, boiled with the activity of soon to die fish.

It seemed that as the rampaging waters crashed down and eastward from Estes to Loveland, native fish sought refuge from wherever offered. This pool, gouged from beneath where U.S. 34 had been, must have offered some respite — at least 30 fish remained there still.

A provider of safety during the flood, this deep shelter was now a shrinking puddle of suffocation. As dangerous waters receded, the pool became isolated. There was no inflow of fresh, life sustaining water and there was no avenue of escape.

Three members of the Corps' Omaha District happened upon the small basin as they inspected the area west of Cedar Cove in north-central Colorado.

Out of the vehicles, where the highway had been eroded to less than a footpath, the trio trekked upstream along the roadbed. Drinking in the flood's devastation, they hardly noticed the brief drizzle.

From their vantage (where the road had been), the high water mark could be easily seen, 300 yards across the canyon. Bark was stripped from trees, roots bared and the canyon wall eroded — all to the same level — making a distinct line to follow.

On their side of the river the devastation was more dramatic.

The road was shorn away. The two-lane blacktop was overswept, undermined and carried off. Where there had been road was now a 25-foot drop.

All had been consumed: roadway, base and more.

It was at the bottom of this destruction, below them, that the attorney and two engineers spied the isolated pool.

After a few minutes of scanning the water (each counting and searching for surfacing fish), the three started down to the pool.

The recent sprinkling proved almost too helpful in hastening their descent. A twisted culvert pipe helped break their slide.

Quickly surveying the situation, Bob and Pete began digging a small channel from the downstream side of the pool to the river. It would provide the fish with an escape route from the pool.

Although the plan was simple enough, the men found themselves ill-equipped for the excavation work. A small crowbar and a staff from a road sign served as their only tools. Most of the work had to be done with bare hands.

They dug, pried and scraped to make the escape route deep and direct enough for the fish (none less than 10 inches had been seen). It was slow work since the short path was not all sand as it appeared to be; the course was laden with four-inch stones.

This exit channel was soon completed, but it proved anticlimactic since not a single fish made his escape through their effort.

Thinking that the fish needed encouragement they started disturbing the opposite end of the pool. They tossed pebbles and stomped while prodding the distant end with the staff — hoping to force them out.

Terrified by this clamor, the fish huddled — petrified.

For their effort the water became more muddied and the channel remained untravelled.

Disappointed, but not discouraged, the trio began to dig again.

This time a small diversion of the Big Thompson into the upstream side of the pool would provide fresh water for the fish.

Although part of the 20-foot route was downhill, this channel would be far more difficult to excavate since there were several barriers.

Instead of working in a predominantly sandy zone, this was an area of stone. And of this, there was a several-foot section comprised of rocks up to 20 inches in diameter.

The work was hard and the rocks heavy. Each took his turn with the crowbar and staff, wrestling the small boulders from the trench's course.

As a team, the work went quickly, each contributing so that they worked as one.

Soon the last stone was removed and the water began to trickle — run — rush through the trench.

As the fresh water streamed into the pool, the three looked up at each other and heaved a breath of silent satisfaction. The water level began to rise.

They had done their best. Two channels had been vented into the evaporating pool and the fish given a chance to survive.

As they clambered back up to the road, several trout scurried through the first channel.

Broad grins spread over the faces of Ron and Bob and Pete.

A silent applause echoed through the canyon.

— *Omaha District* —

THE ENGINEER PRAYER

Our Father, who has designed and built the universe in which we dwell, we realize that you call us to build a house where you can dwell in our midst. We are grateful for the task, O Lord, and yet we must confess that we have often mislaid your plans.

We thank you, Lord, that you continue to build

and that your work serves to remind us of your greatness.

We thank you for the food we are to receive, and we thank you for this occasion that honors fellow engineers and that brings us all together.

Help us, O Father, to build homes that speak of love, to construct industrial plants that serve the needs of mankind, and erect courthouses that testify to your justice.

AMEN

ANSWER TO OUR PROBLEM

Continued From Page 6

SOLUTION: The synergistic effect is 2 tanks or 25%, the combat multiplier is 2. The total of the two separate systems is 8 tanks destroyed. The tanks destroyed when the two systems are combined is 10 tank losses. The extra 2 losses is the synergistic effect the minefield provides the anti-tank weapons in the defending platoon. The 2 compared to the 8 expected is the 25% synertistic effect. It makes no difference if the 2 extra kills are a result of mines, AT weapons, or both as in this example.

The addition of mines doubled losses from 5 to 10 of the anti-tank weapons. So the combat multiplier is 2, it is also 100% but a multiplier is not given in a percentage. The multiplier includes the synergistic effect and the pure minefield kills.

Other observations are only academic. The anti-tank weapons do not multiply the effectiveness of the minefield. (If it did. it would be 3⅓). The 3 tanks, 20% loss factor of mines is a test or control figure only. The tankers forced the minefield and only ran over mines they did not see or could not stop or steer away from in time. In a real situation, once the minefield was detected, engineers would be called to breach a lane. Total losses would be reduced to 1 or 0. So if you extrapolate that minefields alone, without cover and observation, are effective to stop 20% of a tank force, forget it. Cover and observation are vital today, as 30 years ago, to make any minefield, including scatterable minefields, effective.

TANKERS AND ENGINEERS

Tankers and engineers at Ft. Bragg merged talents on range 79 recently to test the firepower of an M551 Sheridan Airborne Assault Armored Reconnaissance Vehicle against anti-tank obstacles in a live fire training exercise — the first of its king here.

Company C, 27th Engineer Battalion (Combat) (Airborne), worked through the night building barricades specifically designed to halt the advancement of a large armored vehicle.

Reconnaissance vehicles from Company A, 4th Battalion, 68th Armor, 82d Airborne Division, moved onto the range the next afternoon to link up with the engineers.

"We went down and took a look at the obstacles prior to firing," said Sergeant Terry L. Garner, a Company A tank commander. "We saw how they were constructed and how we could do the most damage."

Firing from 600 meters with 152mm, High Explosive Anti-Tank (HEAT) rounds, the tankers destroyed a triple concertina fence and a double apron fence with the first three rounds.

They also succeeded in blasting a path through log obstacles. However, they could not successfully cross a 10-foot trench.

"We just couldn't get across that trench — even the manuals say you can only cross a 7-foot trench successfully," said Sgt. Garner. He admitted that being able to see the obstacles prior to firing was an advantage they normally wouldn't have. They also used more ammunition than would normally be used.

"But the first three to four rounds demolished the obstacles enough to cross them, so the training exercise proved we can do it," he said.

The training exercise also proved the engineers' effectiveness, said Company C First Sergeant Elias Rosas.

"Our goal was to detain their aggression as long as possible, forcing them to use as much ammunition as possible. From our standpoint, it worked, although the engineers build obstacles all the time during field exercises, they've never had the opportunity before to see the tankers in action. It helped us quite a bit."

The tankers echoed this feeling, according to Sgt. Garner. "This exercise was a little more realistic because it was out in the woods, with real ammunition and real obstacles. We weren't firing at artificial targets and it made a difference."

Troops interviewed agreed that it was a worthwhile experience — unique in every way. Both companies felt the exercise was an outstanding training opportunity.

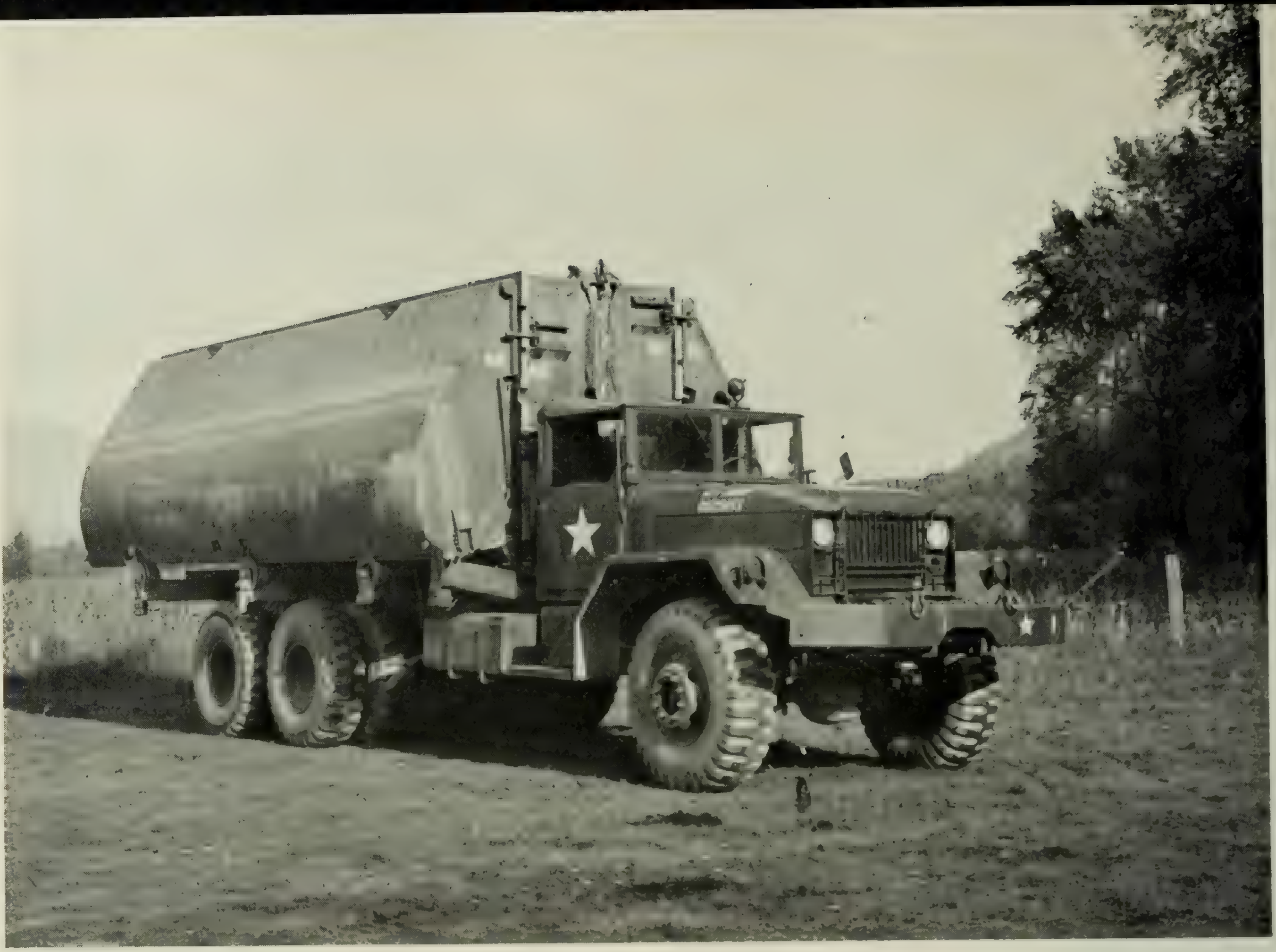
RIBBON BRIDGE IN GERMANY

EDITORS NOTE:

After taking seven years to progress from the initial concept on a drawing board, through prototype fabrication and testing, through initial production and initial production testing, the Ribbon Bridge made its first appearance in the hands of the user in August of 1976. The first unit to be issued the bridge was the 814th Engineer Company, 559th Engineer Battalion in Hanau, Germany.

The Ribbon Bridge was developed in response to the realization that, with the introduction of the PMP bridge, the Soviet Union and other Soviet Bloc countries had tactical bridging capabilities which far exceeded those of the United States in terms of deployment time. The M4T6, mainstay of US bridging equipment, was slow and cumbersome to erect. Since it took over six hours to erect a 120 meter bridge, the element of surprise was virtually eliminated and the bridge was vulnerable to enemy fire. The PMP, on the other hand, could be erected at rates of up to 6 meters per minute, allowing a bridge to be built before opposition could be mounted. This capability was subsequently demonstrated by the Egyptians in the Yom Kippur War of 1973.

The American Mobile Assault Bridge could compete with the PMP in terms of erection speed but, due to its high cost, it could only be used in limited quantities to provide assault capabilities. The Ribbon Bridge was developed by the US Army Mobility Equipment Research and Development Command (MERADCOM); Ft. Belvoir, Virginia and, not surprisingly, it looks and works almost exactly like the PMP. The principle difference is that, while the PMP is a steel bridge, the Ribbon Bridge is made of aluminum to save weight and permit a 5 ton truck to transport it. The main advantage of the "ribbon" type bridge is that it is



essentially pre-assembled and each 6.7 meter long module or "bay" is transported on a modified M812 5 ton truck chassis which can automatically launch a bay in less than one minute in most conditions. A minimum of manpower is required and the latching and pinning operations required to connect one bay to another can be accomplished in about one minute.

After the bay, which is transported in the folded condition, is launched, a bridge erection boat ties up to the bay and moves it to the bridge center line where it is connected to other bays to form a bridge. Other means of erection include constructing a series of rafts and then connecting the rafts together to form a bridge, and constructing the bridge along one shore and swinging the whole bridge into position. Erection rates of from 3 to 6 meters per minute are possible depending on conditions and the method of assembly. The end or "ramp" bays are equipped with hydraulic cylinders which allow the tip of the ramp to be raised about 1.3 meters above the water line to adjust to various bank conditions. The bridge bays can also be connected into rafts for ferrying material across the water. A bridge or raft can be disassembled almost as quickly as it is assembled since the transporter virtually self-loads a bridge bay in two or three minutes. A complete bridge can carry a class 60 load in currents up to 2.5 meters per second and a five bay raft can carry up to 75 tons in similar currents. Due to its streamlined shape, very little anchorage is required and normally end anchorage or bridge erection boats are sufficient to maintain bridge alignment.

A special cradle was developed to permit the bridge transporter to carry, launch, and retrieve the bridge erection boat without the use of cranes. The boat can be launched in one minute and retrieved in five minutes or less. A pallet was also developed to allow the transporter to haul cargo when it is not carrying bridge bays or boats. The pallet can be launched and retrieved while loaded with cargo.

The 814th received 30 Interior Bays, 12 Ramp Bays, 14 Boat Cradles, 56 Transporters and 56 Cargo Pallets. The Ribbon Bridge was fielded under the US Army Materiel Development and Readiness Command's (DARCOM) "Project Hand-Off." Under this program, DARCOM or contractor representatives stay with a newly delivered system until the user is satisfied that all problems are solved and the system is performing well. In order to insure proper training and user satisfaction, a New Equipment Training Team (NETT) was sent to Hanau by the US Army Troop Support Command, St. Louis, MO. The NETT was assisted by personnel from MERADCOM. The unique aspect of the training program was that a bridge company from the Army of the Federal Republic of Germany (FRG) was invited to participate. This invitation was extended in response to a request from the FRG for an opportunity to use the Ribbon Bridge and evaluate it for possible adoption by their Army.

The joint training exercise was broken down into four phases, each one subjecting the equipment and the operators to increasingly difficult conditions. Phases I and II were conducted at Hanau, with the German troops billeted in the US facilities. Phase III was conducted on the Rhein River at Leeheim with all troops bivouaced at the site. Phase IV was based at the FRG's Pioneer Kaserne in Ingolstadt on the Danube River.

During the first phase, from 8 September through 17 September, the NET team instructed officers, NCOs and civilians in the fundamentals of launching and retrieving bridge erection boats, connecting bays together and handling bridge bays and rafts in the water. The Germans used their own bridge erection boats at all times. Although some classroom preparation was necessary at the start, the great majority of the time was spent actually operating the equipment on a pond and on the Main River. The students were given as much practice with the equipment as possible and they generally found that launching the equipment and connecting the bays together was extremely easy. Retrieval was not so easy. Coordinating the boom and winch controls is more of an art than a science and most students required quite a bit of practice before mastering the process. At the conclusion of this two week period the "key personnel" which had been instructed were familiar with the equipment and they were ready to assume their roles as instructors during the next phase.

Phase II, lasting from 20 September to 8 October was the start of training for the soldiers who would eventually operate the equipment. Two entire float bridge companies, one American and one German, practiced over and over again, becoming more proficient each day. The key personnel were heavily relied upon to give instruction and supervision since the NET team could not possibly pay close attention to 190 men training at five launch sites on the Main River. The river was flowing at one half to one meter per second, near ideal conditions for the first exposure to a new piece of equipment.

The third phase, from 11 October to 12 November, was when the fundamentals learned were put to use in large scale bridging and rafting exercises under difficult conditions. Night rafting operations were conducted and complete bridges were built across the Main. It soon became evident that the Ribbon Bridge could be rapidly erected by troops having only three weeks of training. The first bridge across the Main, about 120 meters, was built in only 65 minutes. This time was cut to 47 minutes the second time and 27 minutes, or 4.4 meters per minute, the third time! Midway through this phase the training site was moved to the Rhein River where the stream velocity ranged up to one and one half meters per second. Under these conditions, the average rate for building a 120 meter bridge was 50 to 60 minutes, including launching the boats. The average construction time for five bay rafts was 30 minutes. Retrieval took approximately the same length of time.

The fourth and most difficult phase began on 18 November and ended on 31 March. This training took place on the Danube River at Ingolstadt, and on the nearby Naab River. Stream velocities on the Danube ranged from 1.4 to 2.6 meters per second. The Naab flowed at one half meter per second but the shallow water and poor shore conditions provided different sorts of operational problems. On 15 February, the joint exercise came to an end and the German Army began six weeks of field testing to make a final determination on the bridge's suitability. Approximately 25 men from the 814th remained with the bridge for administrative and maintenance purposes. Working on swift waters did not create any serious problems but launching and retrieving the equipment was more difficult, and the boats were often required to keep bridge bays aligned properly during retrieval. The erection times increased considerably. There was no doubt that as stream velocities increased erection rates were very dependent on the skills of the boat operators. When the exercise was finished the US troops knew that they had a much improved bridge and the FRG had obtained a thorough knowledge of the bridge's capabilities upon which to base their decision.

In summation, the Ribbon Bridge was put through a grueling 7 months of intensive use by American and German troops under a wide range of conditions. The response of the troops using the bridge was generally very favorable. This bridge, like any other, has its defects, mainly related to retrieval in swift currents and adapting the ramp section to varying shore conditions. The advantages far outweigh the defects and the Ribbon Bridge will provide the US Army and possibly other armies with the capabilitity to bridge rivers in a fraction of the time it now takes. By any definition, the Ribbon Bridge is a giant step forward in the field of river crossing equipment.

The Tactical Access Egress System

Current articles concerning the challenges engineers can expect to face in supporting assault crossing's usually only touch the tip of a very troublesome iceberg. The full range of challenges that engineers will have to overcome during tactical river crossing operations is the greatest test of our ability to aid an assault force's mobility and survivability on the modern battlefield. A single crossing operation can require more intensive engineer support than any other tactical operation. That is why at the US Army Engineer School (USAES) (Directorate of Combat Developments) concentrated effort is going into the development of new concepts and materials which will allow accomplishment of *all* the tasks faster, better and with less effort.

Three elements conspire to delay or stop our assault columns at a river; the enemy, weather and terrain.

At Combat Developments, we are looking at how all three elements interrelate to create a formidable obstacle which our combat engineers will have to overcome. A closer look at these three areas will show just how awesome our task is.

The Soviets consider a water obstacle as a natural obstruction enabling the organization of a firm defense. When defending river lines, they create obstacles and prepare demolitions in their security zone (our covering force area), at the river, on the shores, and throughout the depth of the defense.

Their obstacles in the water and on the shores are planned as obstructions for reinforcing the river. For this purpose, underwater obstacles are set up, the river is reinforced, floating obstacles are used and preparations are made to destroy all hydraulic structures, bridges, local crossing equipment. Fords are left in a impassable condition.

River mines (anchored, shallow water, floating) and land mines are used as water obstacles in conjunction with non-exploding obstacles—antitank obstructions, antitank obstacles, and barriers.

Along with setting up mine fields, preparatory work for the demolition of objects is conducted in the defensive zone of their division. Such objects can be accessible sections of the locality, defiles and road junctions.

During combat operations in the security zone, Soviet engineer troops use harassing mine fields for protection, especially along the main roads. Moreover, engineer troops are deployed for setting up obstacles and facilitating demolitions of withdrawal routes.

In addtion to their static defensive measure, the Soviets use mobile defensive tactics to repulse crossing attempts.

An "enemy" approaching a water obstacle is taken under fire at maximum range. Nuclear and chemical weapons can be employed against concentrations of personnel, crossing equipment and our fire support means. Antitank guided missiles, tanks and other artillery are brought up close to the river bank to lay direct fire into our forces engaged in crossing the river. Once our elements have crossed the river, our hold on the near bank will be subjected to counterattacks by second-echelon and reserve forces while first-echelon forces will attempt to prevent additional units from crossing and reinforcing the elements already on the Soviet side of the river.

Within this tactical environment, the engineers will have to overcome the natural environment of weather and terrain as if it is second nature. To get to a river, into and across the water, and to clear the far shore presents a very significant mobility problem. Failure to move through a crossing area quickly will cause reduced unit survivability, congestion, confusion, defeat in detail and finally, collapse of the attack.

Soft clay-silt soils, which usually surround river valleys, often have a high soil moisture content, are regularly cultivated or are covered with thick undergrowth and dense forests. Steep slopes, both at the river bank and extending inland can deny access to, or exit from, the crossing area. Though these conditions may extend throughout the battle area, they are especially detrimental in the immediate vicinity of proposed crossing area. In addition to the difficulties for amphibians, our wheeled bridge transporters can find moving to the crossing sites to be difficult or impossible. Rain, spring thaws, and seasonal variations in the use of the soil can make cross country movement doubtful. Even if our amphibians get across the gap, our lumbering wheeled transporters could get bogged down short of the river preventing erection of vital bridges for tanks, thus stranding our light assault echelons on the far shore.

Movement along roads will be restricted by Soviet actions and we'll have to rely increasingly on our questionable cross country movement ability in the vicinity of crossing sites to get to areas which are tactically desireable. As it stands now, given a normal combination of weather and terrain in the European theater, our crossing areas will be dictated not by where we want to go but where we can go — and the Soviets know it.

Once a bridge or raft is in operation, repeated passes by heavy vehicles (possibly up to 2000 passes at tactical bridge sites) over the ground to the crossing site can destroy any load bearing capacity of the soil. Even after just a few passes, the bridge access road could become a quagmire of sinking wheels and tracks. The route to the bridge must be a sure route, clear of obstacles and strong enough to support the traffic expected to pass over it.

In the past, the preparation of bridge access/egress routes by pioneer methods could normally be completed before the bridge was emplaced because of the slower assembly times associated with older bridges. (For example, a 20 meter M4T6 float bridge required approximately five and one-half hours to assemble and emplace). Today, however, modern float bridges such as the Mobile Assault Bridge (MAB) and the Ribbon Bridge have reduced time and manpower requirements to the extent that, once the equipment is on site, a 120 meter bridge can be emplaced in 45 minutes or less.

Obviously, the advantages of the new generations of float bridge will be lost if an inordinate amount of time and effort is required for the bridge transporter/launcher to gain access to the crossing site, or if five and one-half hours are required to open bridge approaches to traffic.

To aid combat engineers in meeting the challenge, we are well into a research and development effort, the Tactical Bridge Access/Egress System. This development effort in combination with procurement of the Universal Engineer Tractor offers solutions to the problem. We are addressing all the interrelated problems which cause rivers to become such formidable barriers. Part of the effort has already been funded and preliminary work is underway at the US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, awaiting signing of a formal Letter of Agreement (LOA) for Advanced Development of the System. The full spectrum of existing civilian technology and some new ideas will be examined to find the best candidate for adaptation and incorporation into the military inventory. Though the system is as yet of undetermined design, its purpose will be to maximize the advantages of rapidly emplaced mobile gap crossing equipment. The ultimate goal is to provide combat engineer and bridging units the capability to quickly gain access to tactically advantageous crossing sites to emplace bridges, etc, and to install access/egress roadways suitable for assault vehicles and for sustained passage of tracked or wheeled traffic between existing roads or trafficable sites on both sides of the gap.

There are a number of known technological approaches for solving the tactical access/egress problem. Some which have already been investigated and show promise include:

Subgrade Strengthening Systems—

- Inflated (pillow like) elements which can be used as underlay for structural surfacing or trackway elements to directly support vehicle traffic.
- Prefabricated or fabricated in place foamed plastic elements as underlay or stub pile systems for structural surfacing or trackway elements.
- Random or woven synthetic fiber membranes laid directly on soft soils as underlay for base course or base course substitute systems.
- Neoprene or vinyl coated nylon fabric waterproof membranes as underlay for base course or base course substitute systems.

- Expendable box grid systems (egg-crate) composed of sheet metal, plastic or treated paper embedded in soft soils.
- Rapid strengthening chemical stabilization systems.

Base Course Substitute Systems—

- Structural element treadway runners over waterproof membranes.
- Waterproof membranes over random or treadway structural element runners.
- Expandable box grid systems filled with bank run sands and gravel over membranes.
- Sandwich construction of membrane and soil layers including membrane encapsulated soil layers (MESL).
- Structural element beams between inflatable pillows or foamed plastic piers.
- Rapid chemical stabilization of bank run sands and gravels.

Surfacing Systems — To support user vehicle traffic over subgrade strengthened base course or base course substitute systems, and to support traffic on steep slopes, rapidly placeable, lightweight structural surfacing materials will frequently be required. The following types of materials will be evaluated or developed:

- Existing airfield type landing mat surfacings.
- Airfield and heliport waterproof membrane surfacing.
- Fiberglass-resin surfacings (i.e., Mo-Mat).
- British assault trackway.
- Other rapidly placeable lightweight articulated structural systems in continuously linked configuration.

All of the technological approaches discussed will be examined as to their potential to meet the goal of providing a tactical bridge access/egress system compatible with modern, rapidly emplaced gap crossing equipment (Mobile Assault Ferry, Ribbon Bridge) as well as the equipment being developed for the System of Bridges for 1985 and Beyond. This system shall provide the following broadly stated capabilities:

- Stream egress points for swimming and fording combat vehicles. Egress points capable of withstanding 25 passes by vehicles up to MLC 60 are required. The system must enable one combat engineer squad to install 2 points in 15 minutes.
- Access lanes for use by gap crossing equipment to reach bridge launch sites. Access lanes capable of withstanding 50 passes by vehicles up to MLC 25 (essential), MLC 35 (desirable) are required. The system must enable 10 people from the bridge launching unit to install single lanes at the rate of 100 meters in 15 minutes using equipment organic to the bridge company.
- Crossing site access/egress routes for corps/division traffic. Access/egress routes capable of withstanding 2000-3000 vehicle passes (10% MLC 60) are required. The system must enable one combat engineer squad to install single lanes at the rate of 150 meters in 45 minutes (required), 30 minutes (desires).

The tactical bridge access/egress system will also be sufficiently mobile to accompany the force supported (compatible with that of the tactical bridge equipment itself). This system, whether used with current bridges or with the mechanized systems envisioned for the post 1980's, will provide a great improvement in our operational capability and significant reductions in the cost (in men, time and material) of preparing access/egress roadways. These operational improvements will be realized in the effectiveness of bridge units, supporting combat engineer units, and the supported tactical elements of the divisions and corps when the system is fielded to replace todays pioneer construction methods. We will be able to gain access to one or more *selected* crossings sites in minutes, instead of hours, and be able to build access/egress roadways at both ends of the bridge at a rate of at least 10 times faster than is currently possible. Mission delays due to water obstacles will be minimized, tactical commanders will have a wider choice of possible crossing sites, and swimming and fording vehicles will be provided those much needed quick exit points.

The Engineer School is not standing still. We are actively working on ways to insure that engineers in the field have the means to "Win the First Battle." Within the next few years, combat engineer bridging units will be receiving the equipment that will enable them to go anywhere anytime to accomplish their mission.

CPT Robert Sperberg received his BS in Civil Engineering from VMI and is a Registered Professional Engineer in the Commonwealth of Virginia. His assignments have included duty with the 9th Engineer Battalion (Combat) in Germany and the Facility Engineer Activity in Korea. Presently he is a project officer in the Concepts and Studies Division, Directorate of Combat Developments, Ft. Belvoir. As one of his projects he is developing the Concept of Employment for the Tactical Bridge Access/Egress System.

A New Way to Prepare for Your SQT-3

How does a 12B (Combat Engineer) prepare for the Skill Qualification Test (SQT) at level 3 and develop expertise in training, leadership and MOS critical tasks? Attend the Basic Noncommissioned Officer Course for Combat Arms (BNCOC/CA), that's what!

The BNCOC/CA replaced the Engineer Noncommissioned Officer Basic Course (ENCOB) taught at Ft. Belvoir. The reasons for the change were based on the fact that during four years of operation the NCOES Basic Course only trained 10% of the required NCO's (SSG) needed by the Corps of Engineers. Costs were high due to the singular location of the service school and course length. The loss of a squad leader coupled with a shortage of trained squad leaders caused strains on unit effectiveness. This led many commanders to send those individuals that they could do without, to the ENCOB Course. Reserve components also complained that the length of the course was not conducive to their training cycle.

To alleviate these problems, BNCOC was developed. The initial course, BNCOC/CA is for combat engineers. Travel expenses were reduced by locating the course at 16 academies throughout the US, Hawaii, Panama, and Europe (12 academies provide 12B MOS instruction, See Figure 1). The course length was set at four weeks to complete the essential training while reducing the soldier's time away from his unit. The course design used the performance oriented training concept. The tasks taught, are those critical to job performance at skill level 3 and prepare him for the SQT at that level.

And now, essential facts about the course itself. An individual selected to attend BNCOC/CA, must demonstrate mastery of selected skill level 1 and 2 tasks. Mastery of these tasks is essential if the student is to comprehend the material taught during the course. A prerequisite test, issued by the NCO Academy, provides the basis for judging the individual's competency. Selected reference material also is provided so that the student can study prior to attending the course.

The course has three phases (see Figure 2). Phase I consists of pretesting and how to conduct performance oriented training. The pretest, de-

SKILL LEVEL	COURSE TITLE	DURATION
5	Senior NCO Course (SNCOC)/SGT MAJ Academy	
4	Advanced NCO Course (ANCOC)	12 WKS
3	Basic NCO Course/Combined Arms (BNCOC/CA)	4 WKS
2	Primary NCO Course/Combined Arms (PNCOC/CA)	4 WKS
1	One Station Unit Training (OSUT)	12-14 WKS

FIGURE 1

BASIC NCO COURSE FOR COMBAT ARMS (BNCOC/CA)

PHASE I INDIVIDUAL TRAIN TO TRAIN	PHASE II TRAIN IN MOS CRITICAL TASKS USING TECHNIQUES ACQUIRED IN PHASE I	PHASE III TRAIN AS COLLECTIVE TRAINER
PRE TESTING CONDUCT OF PERFORMANCE ORIENTED TRAINING (USE OF TRAINING MATERIAL, TECHNIQUES AND DEVICES)	11B INFANTRYMAN	COLLECTIVE TRAINING TECHNIQUES FIELD EXERCISE (ARTEP EVENT—REALTRAIN TECHNIQUES)
	11C INDIRECT FIRE INFANTRYMAN	
	11D ARMOR RECONNAISSANCE SPECIALIST	
	11E ARMOR CREWMAN	
	12B COMBAT ENGINEER	
	13B FIELD ARTILLERY CREWMAN	
	13E FA CANNON OPERATION/FIRE DIRECTION ASST	
	16P CHAPARRAL CREWMAN (REDEYE)	
	16R SHORT RANGE AIR DEFENSE ARTILLERY CREWMAN	

NOTE: THE CORE BNCOC/CA CURRICULUM WILL REQUIRE APPROXIMATELY FOUR WEEKS TO CONDUCT; HOWEVER, THE LOCAL COMMANDER MAY INCREASE LENGTH TO INCLUDE ADDITIONAL TRAINING DEEMED NECESSARY.

FIGURE 2

termines, for each individual, which MOS-critical tasks learned during Phase II. If an individual demonstrates mastery of a task by successfully completing a pretest, he will be exempted from normal instruction in that task and may be selected to teach a portion of that task during Phase II.

The instruction on performance oriented training is designed to prepare the individual to effectively conduct performance oriented training for his subordinates to accomplish critical tasks found in the Soldiers Manual using the various techniques, training materials, and devices available.

Phase II consists of training MOS-critical tasks using the methods and techniques acquired during Phase I. All training is geared to performance oriented training. Each student is graded GO or NO-GO on each task. If a student receives a NO GO, remedial training can be given and a retest taken based on the availability of the schools cadre. If a student demonstrates mastery of a task in the pretest but is not selected to teach or assist in training a task in phase I, then he will be offered additional skill training. Additional skill training (AST) is instruction on selected tasks at skill level 3 and 4, and on which a student can train with self-paced materials and little instructor support. Each instructional package for AST includes an average completion time which helps the student to select the appropriate number of AST packages to train himself in the time made available by "passing out" of course requirements in the pretest. Each AST package also includes a post-test so that the cadre can validate the student mastery of the task.

Phase III is a collective tactical field exercise based on ARTEP events and REALTRAIN techniques. The student learns how to conduct and control a combined arms exercise. In this phase he is required to put it all together. All the soldiers from the different Combat Arm MOS's are integrated into a combined arms team and each learns how he fits into the overall concept.

Successful completion of the Course of Instruction will be mastery of all tasks taught during Phase II and completion of the "train to train" block in Phase I. Upon successful completion of the course the student will receive a diploma. If a student is unsuccessful he will receive a statement of attendence. All students will receive a report card, with a listing of all tasks mastered. The student's CO will also receive a copy of the report card, which will indicate to him, areas in which the soldier needs more training and what abilities and skills his squad leader now possesses. The unsuccessful student can be certified as having completed the BNCOC/CA by his CO, if he masters the tasks on which he received a NO-GO, through on-the-job-experience (OJE). OJE will insure that the soldier has all the necessary preparation for his SQT 3.

Now that you know what BNCOC/CA is, your next question is probably, "Who can attend?" First priority will go to the soldier in the skill level 3 position (Squad Leader), who has not previously attended BNCOC or ANCOC. A Specialist 4, Corporal, or Sergeant in this position must first attend the Primary NCO Course (PNCOC). This may be waived for the Sergeant. Second priority will be to those Sergeants preparing for the Staff Sergeant level but not yet in that position. You can see that BNCOC/CA is only one step in the career development of a combat engineer under the EPMS system.

Each course is designed to prepare the individual for the SQT at that level. Although not all tasks will be taught, most will be covered. Other training and skill development will be acquired during unit training and from on-the-job experience.

If you are a squad leader and haven't attended a Basic level NCO course, get your name on the list to go. This course is designed to help you take one more step in the chain of events designed to make YOU a more effective leader and to assist you in attaining the next rung on the ladder to the top.

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SFC Paul Christianson is currently assigned as a project NCO for the Professional Course Development Branch, USA Engineer School. His previous assignments were Squad Leader and Platoon Sergeant in the 2d Engineer Battalion, Korea; 547th Engineer Battalion, Darmstadt *Germany; 299th Engineer Battalion, Vietnam, 78th Engineer Battalion, Germany; and as an instructor at the Engineer School. He is presently working on a degree in Mechanical Engineering from the University of Wisconsin. SFC Christianson has completed the Engineer Officer Basic Course by correspondence.*

BRIDGING THE GAP

MYTHS HAUNT THE NON-COMMAND SPONSORED

For the young soldier (E1-E4 under two years of service) with a family, orders for overseas can be a traumatic experience. These soldiers fall into the category of non-command sponsored personnel.

There seem to be many myths concerning the benefits, or non-benefits, of non-command sponsored personnel. There are even some cases of non-command sponsored families who try to keep their presence a secret in order to avoid such things as tour extension. This is purely a misconception on their part.

There is no tour extension for individuals whose families join them in Europe. There are some families who are not taking full advantage of medical, commissary and Post Exchange facilities because they feel they have to keep a "low profile." These beliefs are unfounded.

First of all, free and complete medical and dental care is available for any dependent who possesses a valid ID card. Care ranging from routine examinations to emergency treatment is available for everyone—command sponsorship has nothing to do with it.

Non-command sponsored personnel are not authorized government transportation to and from the United States but otherwise there are few restrictions for the soldier and his family.

Once the family arrives there are a host of organizations just waiting to help and they are available for everyone. The Housing Referral Office, Army Community Services (ACS), the Economy Wives Club, the Red Cross and the Chaplain's Office are just a few of the agencies that can offer a helping hand.

One other restriction non-command sponsored personnel face is ineligibility for government housing or leased housing and the use of government owned furniture (except excess furniture) for quarters. There is a good chance that a local ACS program, which we'll look at in a minute, will even supply some household furniture.

The financial possibilities are also designed to help. There is the Separate Rations Allowance, which you may already know about from previous assignments. There is the Cost of Living Allowance (COLA) and the Basic Allowance for Quarters (BAQ) that will help make living on the economy a little easier.

When we start talking about finances it is important to remember we are referring to soldiers who arrive overseas at E1, E2, E3 or E4 with less than two years of active duty service. All higher grade personnel (E4 over two years) must be command sponsored to receive COLA and Station Housing Allowance. Your BAQ will not be affected and there is a good chance your unit can authorize Separate Rations.

Living on the economy can be a financial nightmare so if you don't see the words "COLA" or "HOUSE" on your Leave and Earnings statement, see your personnel sergeant or your servicing finance unit. The point is, you are eligible for these allowances and the money is available, so apply.

Trying to find a place to live in the States is a big enough problem but when you are forced to find a residence in a new land things can get mighty rough. That's where the Housing Referral Office comes in.

This office is designed to help everyone no matter what the rank or status. The people there know their job and want to help.

The only legitimate way to move your family into economy housing is with the approval of this office. Normally families are put on a list according to household needs — the number of bedrooms needed and so on.

BRIDGING THE GAP

If you don't want to wait for your name to move up you are perfectly free to look for a place on your own. Don't forget, HRO must approve your selection prior to your moving in.

Housing officials advise soldiers who are in the non-command sponsored category to obtain suitable housing before sending for their families. This will prevent many problems and will also save the soldier from possibly paying expensive hotel bills.

After you have a place to live and have checked into the financial scene, a trip to the Transportation Office is a must. Every family needs those things which make a house a home so the Army will ship up to 225 pounds to Germany for you — free!

According to transportation authorities, your weight limitations at the end of your tour overseas rise to at least 2,000 pounds for household goods and 400 pounds for baggage.

When you are ready to move in, you are going to need the everyday necessities of living until your household goods arrive. ACS offices are ready to fill your needs with such things as pots and pans, dishes, silver-ware, high chairs, and play pens. If the move has been a shock to your wallet, they can also provide expert budget assistance.

If you have specific questions about your non-command sponsored status, get in touch with your chain of command or your Community Service Offices. They all have one thing in common — they are willing and able to help, That's their job.

HOUSEHOLD GOODS CLAIMS

Many soldiers apparently think it is not worth the trouble to make a claim for damaged household goods after a PCS move. From the soldier's standpoint, the Army is providing a free insurance policy on personal property shipped in conjunction with an authorized move. Granted, the insurance is limited but it does give the soldier and his family some protection.

High value items (cameras, stereo, stamp and coin collections and works of art as an example) may be shipped at government expense. The soldier must first request permission from the local Transportation Office and the items will be shipped in a special shipment. If the shipment is lost or damaged, the Army can only pay certain maximums on such items. Soldiers are advised to purchase additional insurance for high value articles. The maximum government liability for high value items is spelled out in chapter 11 of the claims reg, AR 27-20.

Most household goods purchased within six months of shipment may be reimbursed for the full amount in case of loss or serious damage. After seven months, the item is depreciated. The depreciation is computed on a yearly basis so that a couch that is one year and seven months old would be depreciated as if it were two years old.

Claims officials say that different items of household goods depreciate at different rates on the yearly basis but maximum depreciation is 75 percent of the original value.

Alcohol and drugs are items that cannot be shipped under any circumstances. War trophies can be shipped but will not be reimbursed if lost, stolen or damaged. Other items that will not be reimbursed include intangible items, such as stocks, bonds, baggage tickets, bankbooks, etc. In addition, any form of currency will not be reimbursed.

If a soldier finds that there is damage to household goods or that they are missing from the shipment, the following items will be needed to file a claim:

- Copies of the PCS orders authorizing shipment of household goods.
- A copy of the Government Bill of Lading (GBL).
- A copy of the inventory made during packing.
- The delivery receipt.
- An inspection report (if the value is over $500).
- A copy of the tracer action (if goods are missing).
- An estimate of repairs (for repairable damage).
- Power of attorney (if anyone other than the servicemember is making the claim).

For further information on the claims program, soldiers should contact their SJA claims officer or consult AR 27-20.

SHIPPING YOUR POV TO EUROPE? THEN READ THIS ARTICLE, IT MAY SAVE YOU SOME HEADACHES AND A FEW DOLLARS.

Officials at the Military Traffic Management Command, (MTMC) say that too many soldiers on orders for Germany are not aware of the strict vehicle inspection standards and very high insurance rates.

According to the chief of MTMC's Ocean Terminals Division, insurance rates in Germany vary according to age, grade and marital status. A single soldier, 18-25 years old with a sports car, can expect to pay three to four times the insurance paid Stateside, and this is just for the legal minimum coverage. At the least, a soldier should plan to pay double the Stateside premium.

The Chief also stated, "If the soldier has a valid current Stateside drivers license, he is not required to take a driving test; however, the written test must be taken. Passing this test requires a thorough knowledge of international road signs and traffic rules."

A lack of knowledge about insurance, inspection and licensing requirements has in some cases resulted in delayed pickup of vehicles.

Specific informatioin on insurance, inspection and licensing in Germany follows:

INSURANCE

Minimum insurance requirement in Germany, liability only, as of January 1977:

E-8 and E-9	Married; age 25 years and over	$211 per year
	Unmarried; under age 25	$275 per year
E-1 to E-7	Married; age 25 years and over	$305 per year
	Unmarried; age 25 years an over	$491 per year
	Married; under age 25	$360 per year
	Unmarried; under age 25	$491 per year

All insurance premiums must be paid within 90 days. POV cannot be picked up until proper insurance is obtained.

CATALYTIC CONVERTER INFORMATION

Catalytic converter should be removed prior to oversea movement if possible and legal. This can save the owner time and money. All Ford and Chrysler products have to be serviced at Autohaus Columbus, in downtown Bremerhaven. The charge is $35.00. A word of caution: Ford and

Chrysler product catalytic converters are not serviced on Saturdays. General Motors catalytic converters can be serviced at the European Exchange Service garage for a total charge of $11.75. This includes the adapter that goes into the neck of the gas tank.

INSPECTION REQUIREMENTS

Lights: All exterior lights must be in proper working order.

Horns: Must be in proper working order.

Brakes: All brake systems must be in proper working order, including the hand or emergency brake. The POV must be brought to a smooth stop with no evidence of side pull. Chatter or pull to either side while braking will constitute an unsatisfactory condition.

Tires: All treads must be at least one millimeter deep. Tire walls will be free of breaks or cuts to the extent that breaker strip, cushion gum or fabric does not show. POVs equipped with reversed rims or with tires that extend laterally beyond the fenders are prohibited. Studded tires cannot be used on German highways.

Wheel Alignment: Vehicle will be rejected when steering wheels 18 inches or less in diameter have more than three inches circumferential free motion or wheels over 18 inches in diameter have more than four inches circumferential free motion, or when wheels are incapable of being turned from full right to full left without jamming.

Exhaust Line: The exhaust system and muffler will be tightly secured and free from leaks.

Windshield: A break, crack or discoloration which does not impair the driver's vision or create a hazard will not be grounds for rejection; however, the decision as to whether it is a hazard or impairs the driver's vision must remain judgemental.

DOCUMENTATION REQUIREMENTS

In order to pick up his vehicle at the port of discharge in Europe, the member must have a complete set of keys and member's copy of DD Form 788. The member should be prepared to pay any costs of necessary repairs to enable the POV to pass the USAREUR safety inspection. POV will not be released without this inspection.

For registration purposes, owner must present, at time of pick up, two completed AE Forms 1598 (Application for Vehicle Registration) or registration documents and license plates; a "double card" from an insurance company which reflects adequate liability and property damage coverage; a check for $5.00 made out to U.S. Army, 59th Finance; and a USAREUR POV operators license.

The soldier can have his POV picked up by an agency or another individual if two copies of a power of attorney are provided to that agency or individual.

Officials suggest that incoming personnel report to their local installation transportation office (ITO) with all personal property papers upon arrival at their duty station. Queries about POVs or other personal property should be addressed to the local ITO rather than the Bremerhaven Terminal. The POV should be picked up at Bremerhaven within 30 days after notification of its arrival at the Vehicle Processing Center unless permission has been granted by the Commander, Bremerhaven Terminal, for additional storage time based on valid justification.

REVIEWING OMPF DURING THE MICROFICHE CONVERSION

HQDA selection boards use a number of information sources to evaluate a soldier's ability and potential — the primary source being the soldier's Official Military Personnel File (OMPF). By personally reviewing their OMPFs before a particular board meets, soldiers in the zones of consideration can get a good idea of how the board will see them. Additionally, soldiers who regularly review their records have the added assurance of up-to-date and accurate files being available for all personnel management actions.

Soldiers whose OMPFs have been converted from paper to microfiche may review their records by mail. Review by mail enables soldiers to check their files without leaving their commands, thereby saving them travel time and money. Any changes or corrections that may be necessary can be made through the MILPO or by direct contact with MILPERCEN (officer) or the Enlisted Records and Evaluation Center (enlisted).

To date, MILPERCEN has converted general officer, colonel, captain and warrant officer files to microfiche; conversion of the remaining officer OMPFs should be complete by late 1977. The Enlisted Records and Evaluation Center (EREC) has completed the conversion of sergeant major files. Master sergeant files are expected to be converted by the end of May, sergeant first class files by late 1977 and staff sergeant/specialist six files by the end of 1978.

While reviewing their records, soldiers may find that some of the documents formerly contained in their paper OMPFs do not appear on the microfiche copy. During the conversion process, any documents not authorized in AR 640-10 are removed. Any documents not included on the microfiche file can be noted by the soldier and checked against AR 640-10 to determine whether or not the document is authorized in the OMPF.

When microfiche files are sent to soldiers at their request, a reproduction fee of $2 for the first fiche and 5c for each additional fiche is charged and a bill is forwarded with the fiche. Officers requesting microfiche copies of their files should address their requests to Commander; USA MILPERCEN; ATTN: DAPC-PSR-S; 200 Stovall Street; Alexandria, VA 22332. Enlisted soldiers should write to Commander; USA EREC; ATTN: PCRE-F; Ft. Benjamin Harrison, IN 46249. All requests must include the soldier's name, rank and Social Security Number.

Once soldiers' OMPFs have been converted, the microfiche files will be the only documents maintained by MILPERCEN and EREC — and the only copies seen by HQDA selection boards. Also, after conversion, microfiche files will be the OMPFs soldiers see if they review their records at MILPERCEN or EREC. In addition to review by mail, soldier still may review their fiche OMPF when they visit their career managers.

Soldiers whose OMPFs have not yet been converted to microfiche may review their paper files at any of three locations: MILPERCEN, EREC, or the Reserve Components Personnel and Administration Center (RCPAC).

Soldiers planning to visit MILPERCEN to review their records may make appointments with the Records Review Unit by calling Autovon 221-9618/9 or commercial area code (202) 325-9618/9. Officers wishing to review their files must call for an appointment at least three working days in advance of their visit. Enlisted soldiers should call for an appointment 10 to 15 days in advance to allow their paper records to be forwarded from EREC. All soldiers should confirm their appointments shortly before their visit to ensure that their records are available. OMPFs previously committed for other personnel management actions may not be available and a request for review does not guarantee the OMPF's availability.

MILPERCEN's Records Review facility is located in Room 5S33, Hoffman II, 200 Stovall Street, Alexandria, VA 22332. Either the soldier concerned or a designated representative may review the soldier's records. A designated representative may be any person — except someone assigned to MILPERCEN — who the soldier authorizes in writing to review the file. A signed authorization statement from the soldier and proper identification (such as an ID card) must be shown before the representative will be allowed to review the records.

When a warrant or commissioned officer makes an appointment, the review unit automatically requests a current Officer Record Brief from MILPERCEN's Data Management and Reduction Branch. While the officer reviews his or her OMPF and ORB, a representative from the DA Military Systems Division is available to answer any questions about the ORB and to process any required corrections.

Throughout the records review process, records specialists are on-hand to answer questions from all soldiers concerning their OMPFs. These specialists alone are authorized to remove documents to make copies for the soldier. Also, any necessary removals from, or additions or corrections to the files must be handled by the records specialists. Review procedures are monitored closely to ensure that files are returned intact.

In the near future, MILPERCEN will add a new service for soldiers reviewing their files. Final plans are being made which will permit soldiers with missing or outdated official photographs to have new photos taken and added to their files during their visit. AR 640-30 specifies when officers and senior NCOs must resubmit official photographs for their records. Additionally, officers may call MILPERCEN's officer records answering service at Autovon 221-8792 or commercial area code (202) 325-8792 to determine if a replacement photograph is required (see FOCUS Number 4-77, dated 29 March 1977 for details on the records answering service. Additional information on the official photograph service will be outlined in a future FOCUS issue when an implementation date is announced.

In addition to MILPERCEN, soldiers may review their records at EREC or RCPAC. Soldiers wishing to schedule reviews at either of these centers are reminded to make appointments at least two weeks in advance to ensure that their records will be available. Appointments and additional information may be obtained by contacting either of the following facilities:

US Army Enlisted Records and
Evaluation Center
ATTN: PCRE-F
Ft. Benjamin Harrison, IN 46249
Autovon 699-3361
Commercial (317) 542-3361

Reserve Components Personnel and
Administration Center
9700 Page Boulevard
St. Louis, MO 63132
Autovon 698-7733
Commercial (314) 268-7733

Soldiers anticipating a visit to MILPERCEN to review their records should carefully plan their visit in advance. A number of factors should be considered:

- Review requests traditionally rise sharply during the spring and summer months in conjunction with HQDA selection board scheduling.
- Summer is the peak PCS season. Tight scheduling occurs annually at this time as the number of soldiers passing through the Washington area enroute to new assignments increases. In 1975, nearly 5,000 officers and 1,900 enlisted soldiers visited the records review unit between May and September. (Higher 1976 figures are not used due to the increased number of visitors in connection with Washington bicentennial activities.)
- An additional demand for paper records to support the microfiche conversion may make files unavailable for immediate review.
- Reduced personnel resources at MILPERCEN's review unit limit the number of reviews that can be accomplished each day.
- The Washington area is entering its peak tourist season. A shortage of temporary billets and high motel and hotel rates are common during this period.

In view of these considerations, soldiers are encouraged to plan their visits well in advance. In addition to scheduling their reviews as early as possible, overnight accommodations should be found and reservations made at the earliest possible date.

ENGINEER

COLONELS:

RETIREMENTS. Please advise us as soon as possible when you begin to make retirement plans. Even if you have not made ''definite'' plans, the fact that you are ''thinking'' about retiring on or about a certain date would be helpful to us in anticipating vacancies.

ASSIGNMENTS. We will begin planning for CY 78 moves in the near future. If you fall into the category of those who expect to move, please ensure that we have a current preference statement.

GENERAL. The Officer Record Brief (ORB) is to be reviewed routinely by each individual for completeness and correctness. Please ensure that you give adequate attention to this. The ORB is an important document. **Each** entry must be accurate and up-to-date.

LIEUTENANT COLONELS:

PREFERENCE FORMS. There is still a significant number of lieutenant colonels whose most recent preference form was submitted more than four years ago. The form is obviously outdated if you have been promoted since the last DA Form 483 submission because the assignment options necessarily change as soon as you are announced as being on a promotion list.

Assignment officers depend on your preference statement for your input to the assignment process!! Without a current DA Form 483 the only assumption that can be made is that you have no particular assignment preferences.

You should submit a new preference form as soon as you are selected for promotion, and when you are within nine months of completing your present assignment. These are minimum essential submission requirements!

When submitting a preference form, please include a complete resume of your family status in Block 13 (Personal Data), to include the date of birth of your children. If a child is in a school grade other than that which is appropriate for the child's age, it is helpful to know this.

Many preference forms arrive with incomplete duty phone number. Please include the AUTOVON prefix or complete commercial number (to include area code) if you list other than a military telephone number. Assignment officers do not have access to an FTS phone system. For personnel overseas it is helpful to have both duty and home telephone numbers.

In some instances the format of the DA Form 483 does not provide for recording data you wish to have considered. When this problem arises, simply attach an addendum to the 483 with your additional information.

OVERSEAS TOURS. Lieutenant colonels with fewer than four overseas tours and who returned to CONUS from their last overseas tour prior to 1974 can expect overseas assignment upon completion of their current assignment.

ASSIGNMENT OFFICER CHANGE. LTC Thomas Fisher will become the Engineer/Atomic Energy assignment officer for lieutenant colonels effective 27 June 1977.

MAJORS:

COMMAND AND GENERAL STAFF COLLEGE (CGSC). The selection process for Command and General Staff College will be conducted in the same manner as last year. Those to be considered are majors and promotable captains in Year Group 1964 or later. The selection process has several

POTPOURRI

phases. A DA appointed screening board will convene in July to screen all the eligible officers that are already majors or promotable captains. The Major AUS Board that was convened on 19 April 1977 will complete their selection process and then will reconvene to act as the CGSC screening board for the new promotable captains. In August or September the final CGSC selection board will convene to select the actual class from those that made the cut during the screening process. The number to attend the actual class will be selected without regard to rank ordering. The board will also revalidate those officers selected in 1976 who have been deferred for attendance at a later date. These are part of the total selected to attend the class. Additionally, the board will select alternates who will be rank ordered. This list will be used to fill vacancies but will not be published. Expect the results of the process to be published in December.

ASSIGNMENTS. There are no changes from the last issue. Overseas vulnerability remains about the same. Year Group 1964 and earlier can expect a total of four overseas assignments prior to promotion to lieutenant colonel. Year Group 1965 and later did not get caught up in the back-to-back Vietnam tours so their vulnerability is different.

GENERAL. Many of you have received notes and letters from us telling you that you need a physical exam, photo or preference statement. There is only one thing more important in your file than these three items — that being your OER. If you do not have a current, good (presents you in your best light) photo, GET ONE. If your last physical is not current (look on your ORB to determine what is on your record), GET ONE. If you are overweight, lose weight and then get a new photo.

LIEUTENANTS:

PROMOTION. The Captain, AUS, Selection Board is scheduled to convene 10 May 1977-3 June 1977. First lieutenants with a temporary date of rank of 31 January 1976 or earlier will be considered. Good luck!

AIRBORNE TRAINING. Effective 1 October 1977, Airborne training will be limited to those officers, not yet Airborne qualified, who are assigned to an Airborne unit. There is currently no change to officers volunteering for Ranger training.

WARRANT OFFICERS:

WARRANT OFFICER PROFESSIONAL DEVELOPMENT. A new edition of DA Pamphlet 600-11, the warrant officer's career planning guide, was sent to the printer in April. It is expected to enter distribution channels about mid-July 1977. Arrangements have been made to provide each individual a copy of the new pamphlet through their servicing MILPO. For many warrant officers, the pamphlet outlines new career patterns, functional career tracks and the subspecialties within each specialty, and career decision points requiring the election of various options. The effective date of the pamphlet will be 1 April 1978. Warrant officers who have not received their copy by 31 December 1977 should contact their MILPO to acquire one so they can familiarize themselves with the forthcoming changes affecting their specialties.

FOR ALL:

REVIEW OF OFFICIAL FILE. There is no better way for an officer to know how a selection board reviews his or her Official Military Personnel File (OMPF) than for the officer to review it himself or herself. All officers are encouraged to review their files as often as practicable to ensure that assignment officers and future selection boards will get the "complete picture" of the officer's ability and potential. As of March 1977, officers planning to visit MILPERCEN to review their OMPF's must make an appointment **at least three working days prior to their visit.**

STURGIS and ITSCHNER AWARDS presented at the 110th Engineer Dinner

The presentation of the Sturgis Medal to a Ft. Bragg combat engineer highlighted the 110th Annual Engineer Dinner here Friday night, as SSG James Skellion of the 27th Engineer Battalion received the prestigious award.

SSG Skellion, an 11 year Army veteran who participated in the Buffalo snow removal operation last winter, was presented the award by Chief of Engineers Lieutenant General J. W. Morris. The Sturgis Medal is given annually to the enlisted man who makes "outstanding contributions to military engineers while demonstrating technical and leadership ability."

The Itschner Award, given each year in honor of Lieutenant General Emerson Itschner, is presented to the Engineer Company in each component (Active Army, Army Reserve, National Guard) selected as the most outstanding in that component.

The Active Army award went to A Company, 293d Engineer Combat Battalion from Baumholder, Germany. CPT Thomas Nowak, 1SG Donald Wood, and former commanding officer CPT Leon Lang accepted the award for the unit.

For the third consecutive year, a unit from the 99th Army Reserve Component received the Army Reserve Itschner Award. Accepting the award for his company was CPT Frank Prazenica of the 332d Engineer Company, 300th Transportation Group, a reserve unit from Pittsburgh.

LTG Morris presented the National Guard Itschner Award to CPT Robert Treland of the 724th Engineer Battalion, Wisconsin National Guard.

The Engineer dinner commemorated the 202d anniversary of the Corps of Engineers, with LTG Morris emphasizing the importance of engineering in today's Army. In his remarks, LTG Morris lauded the cohesiveness of Engineers. "This year's theme, 'Call to the Castle' conveys a spirit of unity among engineers in all components of the Army."

SURVEY

1. What is your age?
   - 17 to 21
   - 22 to 25
   - 26 to 30
   - 31 to 40
   - Over 40

2. What is your relationship to the Army?
   - Active Army
   - Army Reserve
   - National Guard
   - Retired
   - DAC
   - Dependent

3. If military, what is your pay grade?
   - E1 to E3
   - E4
   - E5 to E7
   - E8 to E9
   - O1 to O3
   - O4 or O5
   - O6 and above
   - Warrant Officer

4. How often do you read THE ENGINEER?
   - Rarely
   - Regularly
   - Every issue

5. How would you rate distribution of THE ENGINEER at your installation unit?
   - Thorough
   - Adequate
   - Inadequate

6. How would you rate the material contained in THE ENGINEER? Check whatever appropriate:
   - Entertaining
   - Useful
   - Believable
   - Stimulating
   - Well illustrated
   - Well rounded
   - Pointedly written
   - Worthwhile
   - Dry
   - Irrelevent
   - Questionable
   - Boring
   - Poorly illustrated
   - Narrow in scope
   - Verbose
   - Superfluous

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7. Would you like to see more or less articles by the following groups (if you're already satisfied, leave blank):

MORE		LESS
______	Junior Enlisted	______
______	Junior NCO	______
______	Senior NCO	______
______	Junior Officer	______
______	Field Grade Officers	______
______	General Officers	______
______	Warrant Officer	______

8. Do you have any comments, criticisms or suggestions for the magazine?

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9. Can you name any articles which appeared in THE ENGINEER that particularly impressed you? ______________

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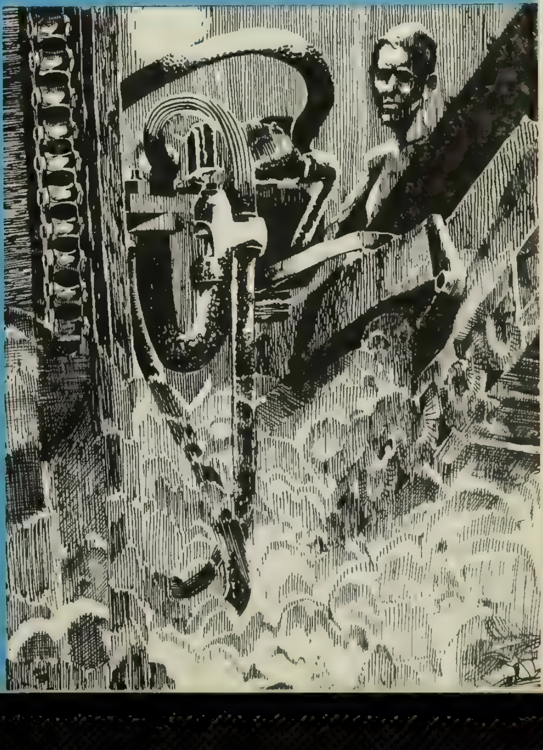

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CHIEF'S BRIEFS

Brigadier General Henry M. Robert was born May 2, 1837 in South Carolina. Upon graduation from the United States Military Academy on July 1, 1857 he was promoted Brevet Second Lieutenant, Corps o Engineers.

Robert taught at West Point and then was assigned fortificatio construction and wagon road exploration duty in the West. During th Civil War he participated in construction of the defenses of Washington, D.C. and in fortifications work elsewhere.

From 1867 to 1901 Robert served on numerous boards dealing wit rivers and harbors, lighthouses, and fortifications. His assignment included duty as Northwest and Southwest Division Engineer.

Upon promotion to Brigadier General on April 30, 1901 Robert wa appointed Chief of Engineers and served in that capacity unti retirement, required by law, two days later.

General Robert wrote the famous compendium of parliamentar law known today as *Robert's Rules of Order*. He died May 11, 1923 a Hornell, New York.

JOHN M. DERVAN
Assistant Curator
U.S. Army Engineer Museum

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.PIPELINE. PIPE

BERH CELEBRATES DIAMOND JUBILEE AS INDEPENDENT REVIEW BOARD FOR ARMY CHIEF OF ENGINEERS

The Board of Engineers for Rivers and Harbors is 75 years old. It was created by Congress under Section 3 of the River and Harbor Act of June 13, 1902.

In celebrating its diamond jubilee, the Board has completed three quarters of a century as the agency of independent review of water resources projects for the Chief of the Army Corps of Engineers. Following authorization and funding of studies by Congress, District and Division Engineers prepare reports on prospective projects which are then submitted to the Board for review. After its review, the Board's recommendations are passed to the Chief of Engineers for further processing to the Secretary of the Army, the Office of Management and Budget, and to Congress for consideration.

During its first 75 years the Board has reviewed more than 8,300 project reports for the Chief of Engineers. Less than 45% of these (3,711) were recommended for construction while more than 4,600 were not.

In addition to its primary statutory mission to review reports on water resources development, the Board is also charged by law to publish information on United States Coastal ports. Port facilities are described in the Port Series, a group of 45 reports which are published on a rotating basis.

The Board also conducts for the Chief of Engineers the primary training program for Corps planners. Each year a class of 15 selected planners throughout the Corps undertakes the Planning Associates Program, eleven months of resident training heavily oriented to policy, plan formulation, public involvement, environmental considerations, benefit analysis, and other pertinent subjects. The Planning Associates return to the Corps Districts after completion of their year at the Board and join the growing cadre of graduates, which now numbers 173.

The Board is unique within the Federal establishment. Created by Congress to provide a uniform overview and approach to planning and construction, its members are chosen by the Chief of Engineers from among the senior general officers of the Corps of Engineers to provide an objective, critical review of proposed projects. The Board is supported by a professional and administrative civilian staff of 66 which includes engineers, environmental planners, economists, and transportation specialists.

VA WORK-STUDY PROGRAM

Full-time veteran students who foresee money problems at fall enrollment time should look into the Veterans Administration's work-study program.

The VA says that new GI Bill payment procedures might leave students who don't have savings from summer jobs in a bind to pay necessary enrollment and subsistence expenses. To help offset this financial headache, VA will make more work-study jobs available.

GI Bill students can work up to 250 hours per semester for VA and receive $2.50 per hour in addition to their usual education assistance allowances. An advance of up to $250 is available as soon as the employment agreement is processed. The advance covers the first 100 hours of work.

Jobs are available for VA-related work on a given campus or at a VA facility. Priority is established on the basis of service-connected disability, financial need, motivation and the nature of the work. After the first 100 hours, VA pays work-study students after each 50 hours of work.

Details are available from campus veterans counselors or any VA office.

CASH PAY OPTION

Beginning July 1 the "CASH PAY OPTION" was eliminated in Korea. All Eighth Army soldiers will now receive their pay, mid-month and end-of-month, by check. According to MILPERCEN officials, the policy change is being implemented to improve efficiency of operations and to provide a better service to the soldiers. Soldiers leaving CONUS for assignment to Korea are encouraged to check on the advantages of establishing a "Check to Bank Option" at the bank of their choice.

ADVANCE SHA

The Army has proposed advance housing allowance overseas. The Army proposal would amend present legislation to authorize an advance

LINE. PIPELINE.

payment of housing allowance overseas. If the proposal becomes law, it will relieve some cases of financial hardships due to the extraordinarily large cash payments demanded for security deposits on housing in certain foreign areas where housing is in short supply.

CHECKBOOK HELP ON THE WAY

The Army plans to distribute a training "package" this summer designed to help arm soldiers with the knowledge required to manage checking accounts properly.

The program is a result of an Armywide survey indicating a basic lack of knowledge concerning checking account management and banking procedures.

Pointing up the seriousness of the problem, Army officials reported that more than $6 million in bad checks were passed at CONUS and Pacific commissaries and clubs last year. (USAREUR figures were not included). Even when the bad checks are redeemed, the administrative cost of processing the checks affects the funds available for morale and welfare support activities.

The training program stresses the importance of sound checkbook management, and warns of the consequences of passing bad checks some of which include administrative or disciplinary actions.

Officials at The Adjutant General Center (TAGCEN) say that the training plan will supplement AR 608-16. Since the reg went into effect in 1975, officials claim that the number of bad checks has declined and expect the new program to reduce the number of even more.

REFORGER UNDERWAY

The strategic mobility exercise REFORGER, in which U.S.-based troop units are deployed to Europe in support of NATO trainig objectives.

This year's REFORGER marks the second consecutive year that troops will arrive in Germany accompained by some of the equipment needed to sustain them. In REFORGERs prior to 1976, only the soldiers moved, drawing prepositioned equipment maintained in readiness at installation sites in West Germany.

Heavy tracked vehicles—including the Army's main battle tanks—will be shipped across the Atlantic. Last year's exercise, REFORGER 76, stressed air assault tactics and featured the large scale movement of helicopters.

Upon closing ranks with Europe-based U.S. soldiers and NATO allies, troops from the 1st Infantry Division at Fort Riley, Kansas and 4th Infantry Division (mechanized) at Fort Carson, Colorado will participate as REFORGER elements in the annual AUTUMN FORGE exercise conducted by NATO's Allied Command, Europe.

All NATO nations with military forces committed to the defense of allied countries have scheduled forces to participate this year. In addition to REFORGER, other AUTUMN FORGE exercises include:

CRESTED CAP—the U.S. Air Force's strategic mobility exercise involving U.S.-based fighter bombers deploying to Germany;

COLD FIRE—a multinational exercise connected with several land exercises in the central Europe region;

DISPLAY DETERMINATION—a sea/land/air exercise in the Mediterranean area involving forces of southern region nations, the United Kingdom and the United States;

ARROW EXPRESS—an Allied Command Europe (ACE) mobile for exercise in the northern region;

ABLE ARCHER—an Allied Command Europe command post exercise.

REFORGER 77 also marks the second consecutive year that personnel of the Military Traffic Management Command's Eastern Area (MTMCEA), will play a major role in the logistical phases of the exercise.

The return phase of REFORGER 77 will begin in late September when equipment moves by train and barge from exercise areas to MTMC's Military Ocean Terminal at Bremerhaven, Germany and Benelux Terminal at Rotterdam.

Major emphasis during REFORGER 77 will be placed on strengthening the interoperability capabilities of NATO allies Common Language doctrine and procedure will be exercised, tested and evaluated by the participants. Improvments in these areas are considered indispensable to providing a reliable deterrent and defense capability by NATO at reasonable costs.

TRAINING NOTES

FM 6-20 IS COMING!

The final approved draft of FM 6-20, **Fire Support in Combined Arms Operations**, the Army's capstone How to Fight manual for fire support, is now being distributed to active Army maneuver and fire support units. This manual provides the first comprehensive treatment of the maneuver commander-fire support coordinatior (FSCOORD) relationship and illustrates how to integrate all fire support into combined arms operations. It was written by maneuver and fire support personnel, with input from elements throughout the Army, and is designed for all members of the combined arms team.

The doctrine contained in the final draft of the FM is approved by HQ, TRADOC, for instruction at TRADOC installations and for training in the MACOM's. The final approved draft will remain current until superseded by the official Department of the Army printing of the manual in late summer 1977. The DA print will be announced by TRADOC message and will be sent to units, both active and reserve, through pinpoint distribution. If units do not receive the manual within 30 to 60 days from the date of the message, it may be ordered via DA Form 17, addressed through publications channels to: USA AG Publications Center, 2800 Eastern Boulevard, Baltimore, Maryland 21220.

FM 6-20 is not an FA tactics manual. Rather, it is the maneuver commander's and FSCOORD's total fire support manual. As such, it complements all TRADOC How to Fight FM's and is to be used in conjunction with those manuals listed in Appendix B of FM 100-5. In addition to FM 100-5, FM 6-20 specifically supports and complements information contained in FM's 101-5, 71-100, 71-101, and 71-2. FM 6-20 will be followed by FM 6-21, **FA Cannon Battalion**, and FM 6-22, **Division Artillery, FA Bridge, and FA Assigned to the Corps**, which discuss tactics and operations for internal FA organizational use. Each manual will be "product improved" as the need arises.

RESERVE AMPHIB TRAINING

Ft. Monroe, Va. (TNS) — Members of the Army's reserve components are now eligible to apply for resident training at the Navy's amphibious school in Norfolk, Va.

Of special importance are two one-week courses in amphibious warfare and planning, which are designed to train combat staff officers who have little or no experience in beach assault tactics.

The catalog may be obtained by writing to Commanding Officer, Naval Amphibious School (Little Creek), ATTN: Senior Education Advisor, Norfolk, Va. 23521.

SQT PERSONALIZED

Ft. Monroe, Va. (TNS) — The new Skill Qualification Test (SQT) is not exactly "personalized" for each soldier, but it is being tailored to meet the soldier's actual job requirements.

A spokesman for U. S. Army Training and Doctrine Command explained that SQT developers have constantly kept in mind that a soldier has certain tasks each day that may not be performed by others in the same MOS. "We want SQT to be as fair and realistic as possible. We knew, for instance that within MOS 11E (Armor Crewman), a soldier could be working with the M60A1, M60A2, or M551 Sheridan. So the test has three "tracks." Some 'tracking' has to be done or the tests wouldn't be fair or valid.

"The SQT is designed to test a soldier's ability to perform the tasks that are critical to success of his mission and survival on the modern battlefield. So we test every soldier — no matter what MOS — in some common soldiering skills, such as first aid.

"Then we get specific. For instance, soldiers in Air Defense MOS 16P could be working with either the Chaparral system or Vulcan. We find out who works with which system and that's the test he gets."

Another MOS which boasts of a "tracked" SQT is MOS 11C, which discriminates between the 4.2 inch mortar and 81mm mortar.

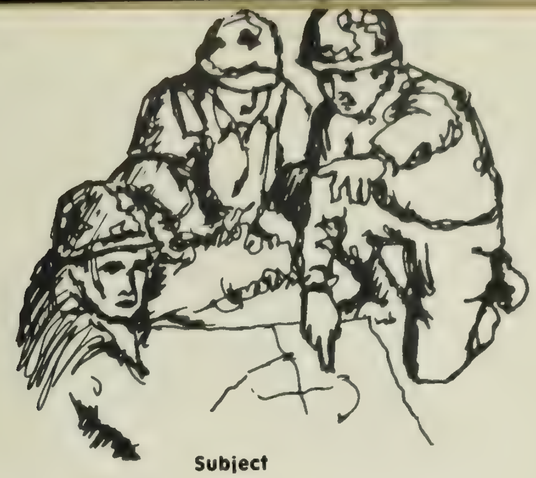
The spokesman added, "Other MOS with obvious differences like those will show up with appropriate tracks to solve the needs of most soldiers."

The spokesman pointed out Test Control Officers (TCO) at each installation have a listing of each soldier by MOS and job. The TCO then tells the Individual Training and Evaluation Directorate at Ft. Eustis, Va., who gets which test.

Approximately 60 days prior to the beginning of the testing period each soldier receives an SQT Notice, which outlines each of the tasks to be tested on his individual SQT. SQT Notices now being prepared include a sample question for each task tested in the written component and a complete checklist for the hands-on component.

ANNOUNCEMENT OF WEEKEND COURSES FOR RESERVE COMPONENTS FISCAL YEAR 1978

The United States Army Engineer School Fort Belvoir, Virginia will conduct weekend courses in FY 78. Each course will be approximately 14 hours long. Application will be through the chain of command. The courses are oriented towards those whom by MOS or job assignment are responsible for planning, conducting or supervising training in the following subjects.



Date	Course Number	Subject
19-20 Nov 77	78-RC-SP1	Mine/Countermine Hardware, Doctrine and Operations at Battalion Level
10-11 Dec 77	78-RC-SP2	Terrain Evaluation
14-15 Jan 78	78-RC-SP3	Engineers in River Crossing Operations
28-29 Jan 78	78-RC-SP4	Division Obstacle Plans and Retrograde Operations
25-26 Feb 78	78-RC-SP5	Engineers in River Crossing Operations
11-12 Mar 78	78-RC-SP6	Division Obstacle Plans and Retrograde Operations
18-19 Mar 78	78-RC-SP7	Mine/Countermine Hardware, Doctrine and Operations

COURSE IN PRIME POWER PRODUCTION OPEN

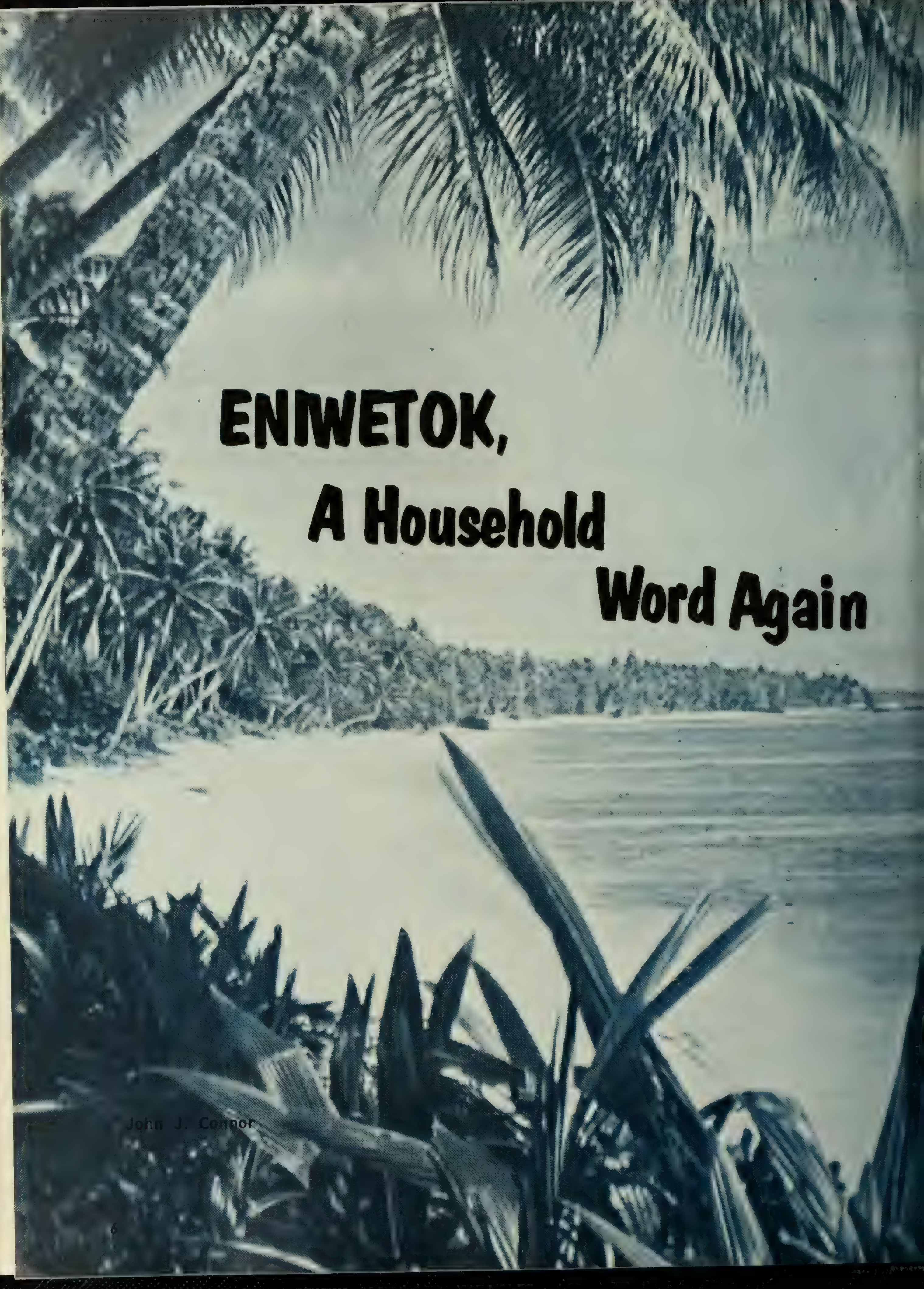
You may be eligible now for training as a specialist in Prime Power Production. Applications are being accepted from career enlisted personnel for studies encompassing engineering, plant technology, maintenance and operations. Those interested should contact their military personnel office immediately for a copy of AR 350-224.

The next class starts in April 1978 so you may want to check requirements for entering the program as soon as possible. If you are grade E6 or less on active duty, scored at least 115 in aptitude area EL and GT, and scored 70% or better in Basic Mathematics and Science Proficiency Test (revised 1975), you may be eligible for this expanding career program.

The year-long course in academics, specialty and operations is conducted by the Facilities Engineering Support Agency (FESA), a field operating agency of the Corps of Engineers, located at Fort Belvoir, Virginia. Teams of highly skilled technicians trained by FESA are being deployed at Army installations around the world to conduct infrared surveys of electrical systems, perform detailed repair and maintenance of utility systems, and put into operation the latest in applied power technology in addition to operating and maintaining the Army's nontactical generator assets. FESA has also taken on an increasingly important role in energy conservation and is now the lead Army agency in this area.

The program offers opportunities for professional work, varied assignments, additional college credit, and life-long benefits. Applications are processed through local command channels to the installation adjutant general. Time may be short to process your application so please respond today if you are motivated to complete the program and gain status in your chosen career as an Army Prime Power Production Specialist. Further information may be had by calling Training Division, FESA: AV 354-5235.

ENIWETOK, A Household Word Again



John J. Connor

Between 1944 and 1958 Bikini and Eniwetok, two atolls in the mid-Pacific Marshall Islands were "household words." They were in the news because they were the sites of American nuclear bomb tests. In fact, the word "bikini" has become a regular part of our vocabulary. According to one dictionary the name infers an atomic bomb when it was first introduced.

Eniwetok is in the news again because of the massive "cleanup" now getting underway there. We can expect to hear much more about this remote atoll as the ambitious project progresses. This article will not discuss the project in any detail but only serves to "introduce" Eniwetok and say a few words about the Marshall Islands and how they have fared since World War II.

Eniwetok (the island looking east) is comprised of 40 islets of a total 2¼ square miles strung on a circular coral reef that rings a lagoon of 388 square miles. Of the 34 atolls and single islands that comprise the Marshalls, Eniwetok is only the thirteenth in land area, but its lagoon is the second largest! Located roughly 2,500 miles southwest of Hawaii, it was first sighted in 1529 by a Spaniard, Alvarado de Saaverda. However, the first record of a westerner setting foot on the atoll was not until 1792.

In the 1930's, Japan began fortifying the Marshall Islands in violation of the League of Nations mandate giving her control of most of Micronesia. Eniwetok was developed as both an airbase and a naval anchorage. When the United States was selecting targets during the "island hopping," of WWII Eniwetok was chosen to be invaded. The operation, code named CATCHPOLE, kicked off on February 17, 1944 as the 22nd Marine Regiment landed on Engebi Island on the northern rim of the atoll. Attacks on Parry and Eniwetok Islands followed. In four days of fierce fighting 339 Americans and 2,677 Japanese died. Bikini Atoll was taken without resistance. Eniwetok now served as an advanced anchorage for the United States Navy and a staging area for U.S. ground forces preparing for assaults on Saipan, Tinian and Guam, 1,000 miles westward in the Marianas.

In February 1946 the United States chose Bikini Atoll as a site for nuclear weapons testing; and in December 1947, Eniwetok was selected as a second test site. First however, the 167 residents of Bikini and the 145 residents of Eniwetok had to be "resettled." When the testing ended in July 1958 both atolls were ravaged. Radiation prevented the relocated inhabitants from returning. Neither atoll is entirely safe today — nearly 20 years later! — but the people of Bikini and Eniwetok still long to return.

The attempt to clean up Bikini began in 1969. In mid-1974 it appeared that the former residents would be "home for Christmas." However, new tests showed that radiation levels were still too high for children, and women of child-bearing age. The effort to restore Bikini was beset with problems to include logistical support and construction costs. A Marshall Islands-based construction firm struggled to complete the project only to find that the community leaders didn't approve. Then came the news of the radiation levels.

When the more ambitious Eniwetok cleanup project was being planned, officials wanted to avoid the pitfalls encountered during the Bikini work, despite increasing costs. The United States felt obligated to revitalize Eniwetok and allow its people to return. In an attempt to lower the price of the initial phase it was suggested as far back as 1973 that Army Engineer troop units be employed. To the surprise of many, this was approved.

Some nostalgia pacific soldiers would be surprised to see the area today. Some of the remote islands have changed little, but life in the District Centers has progressed at a fast pace, especially in the last 7-10 years. At Majuro Atoll 680 miles southeast of Eniwetok, a $3-million Corps of Engineers-supervised construction program was carried out between 1971 and 1974. The products include an international airport and terminal, paved roads, a water distribution system, a vocational high school, a district courthouse, and other municipal facilities. On Kwajalein Atoll, home of the Kwajalein Missile Range, and about 400 miles southeast of Eniwetok, the atmosphere is "suburbia in the mid-Pacific.". But the scene on Eniwetok is still stark. The vegetation shows the effects of the nuclear tests of two decades ago: the palm trees, where they exist, are only half the height of the telephone poles! The rebirth of Eniwetok is really just beginning, but before this project is complete, "Eniwetok" should be a "household word," **again.**

CPT John J. Connor received his BS in Geology from Boston College. He is a graduate of the Engineer Officer Advanced Course and OCS. CPT Connor previous assignments were Project Engineer, for Majuro Atoll, Marshall Islands and Information Officer, HQ 39th Engineer Battalion, Ft. Devens. Presently CPT Connor is retired.

ENGINEER

COLONELS:

REFERENCES PLEASE: If you have moved since you last sent us a preference statement, please submit Nov 75 edition of DA Form 483 in the mail. Sections of Form 483 that are of special interest are family size and ages of children (for school and quarters consideration), whether you are interested in an overseas tour, whether you own a house that you would like to live in, and current address/telephone numbers. The more we know of your current status, the better we can consider and accommodate your "druthers." If the form doesn't suit all your needs, a letter or phone call would be appreciated.

SPECIALTY DESIGNATION: Colonels Division has just finished a complete review and adjustment of specialty designations. One of the major changes was the replacement of the Logistics Management Specialty (SC 70) with other logistics specialties as designations for Colonels. In making changes we have looked at a number of alternate specialties in light of recent assignment experience and requests. Each affected officer should have received a letter specifying any changes. If you have questions, please drop us a note or give us a call.

PLANNING AHEAD: The earlier view we have of changes in assignments the less trauma is created for yourself and others. Let us know about six months ahead if you plan to request an extension or if you begin to make retirement plans. A month or two trade-off in the planning stages may make approvals and relocations easier for all.

LIEUTENANT COLONELS:

WELCOME TO NEW SELECTEES: Congratulations to those officers selected for promotion by the recent Lieutenant Colonel (AUS) board. The competition was tough and each of you can take pride in your selection. You will face new challenges and new demands as O5's and MILPERCEN welcomes the opportunity to work with you in meeting your career plans and needs.

DON'T BE AN ENIGMA! For old and new: Read the comments for Colonels in regard to preference statements. They apply to LTCs, too. If we have your preferences and your telephone number we can discuss your next assignment with you. If we don't have that information, the assumption is that you have no strong preferences. So **please,** take a few minutes to let us know your interests.

SAY IT AGAIN SAM! Most of the assignments LTCs desire require CGSC level schooling. It does not matter how you accomplish it — just that you do. If you have not already attended or been selected for resident schooling, then invest some time in your future by taking the non-resident course. It will open up many opportunities for you and will be time well spent.

POTPOURRI

MAJORS:

Congratulations to those of you selected for promotion to major. You can provide much needed help making up the critical shortage of engineer majors. Your goals as a major should include completion of CGSC (to include the non-resident course if you aren't selected for attendance either this year or next), becoming qualified in your alternate specialty and completing a masters degree which will support engineering or your alternate specialty. Majors Division of MILPERCEN operates differently than does the company grade branches. Each of you now have two assignment officers (myself and your alternate specialty manager) and a professional development officer. All three of us act on each action concerning you, whether it is on civil schooling, alternate specialty change, assignment, etc.

ASSIGNMENTS: Army Readiness Regions (ARR) continue to receive very high priority. At present there are 79 positions that must be filled by engineer majors. Overseas vulnerability is changing! New majors who had one overseas assignment to date, should consider themselves on the launching pad! That does not mean the senior major is entirely off the hook. Many considerations are involved, to include availability, special qualifications for a particular position, professional development, and individual desires.

GENERAL:
MILPERCEN continues to emphasize the importance of such items as a current photo and physical, and an update of your record brief. Also, if your records will go before a promotion board (LTC AUS or RA MAJ) you should review your official file before the board convenes. This is especially important now that your file is being microfiched. If it is impossible for you to visit us, I recommend that you request a microfiche copy of your file. That would provide a check for completeness. Request should be sent to DAPC-PSR-S 200 Stovall Street Alexandria, Virginia 22332. Fees are $2.00 for the first fiche and five cents for each additional fiche; a bill is forwarded when the request is filled.

CAPTAINS AND LIEUTENANTS:

NEW ARMY POLICIES: Effective 16 June 1977, Ranger training is available only for officers commissioned in the Infantry, Armor, Field Artillery, Air Defense Artillery, Engineer, and Signal Corps branches who are eligible for assignments to Category I units, officers scheduled for Ranger assignments, and as voluntary precommissioning training for those ROTC and USMA cadets eligible for assignment to Category I units upon commissioning. Female officers and female cadets are specifically excluded from Ranger IAW Army policy which precludes their assignment to combat or close combat support units or duty associated with a direct combat role. Effective 1 October 1977, Airborne training is available only to those officers on assignment to Airborne units, and as voluntary precommissioning training for USMA and ROTC cadets. As an exception to this policy, USMA and ROTC cadets in classes of 1977, 1978, and 1979, and graduates of OCS classes through FY 78, will continue to be eligible for Airborne training after commissioning regardless of anticipated assignment.

CONGRATULATIONS: Congratulations to those First Lieutenants selected for CPT, AUS. The next CPT, AUS, Board is tentatively scheduled for November 1977.

MANAGED TENURE PROGRAM (MTP): The MTP is the system by which HQDA selects nonregular warrant officers for retention on active duty for periods past their 20th year of Active Federal Service (AFS). In the absence of such selection, nonregulars must be released from active duty upon completing 20 years AFS. Impacting upon the MTP is the continuing growth of the Regular Army Warrant Officer Corps. At its current rate of growth, the Regular Army will provide fill for all of the Army's "over 20" vacancies in the foreseeable future. Consequently, HQDA is currently studying a proposal to abolish the MTP and rely on the Regular Army as the only means for warrant officer retention beyond 20 years AFS. A specific feature of the proposal envisions the creation of an "RA decision point" for warrant officers. The proposition is that individuals must accept a tender of appointment in the Regular Army no later than their 15th year of AFS or their completion of OBV (whichever is later), or be mandatorily released from active duty upon completing 20 years AFS. Individuals would still be able to apply for an RA appointment up to their 14th year of AFS or 2d year of OBV (whichever is later), but at those points in time all nonregulars would be considered by the HQDA Regular Army Selection Board. Those selected by the board would be tendered an RA appointment to be consummated no later than the decision point, i.e., the later date of either their 15th year of AFS or completion of OBV. Individuals in OBV status who are not selected or who decline appointment would still have the option of applying for a VI service agreement that would cover the period between OBV expiration and their 20th year AFS. These proposals are still under study and no decisions have been made to implement them. Meanwhile, HQDA is making arrangements to convene what may be its last MTP board. The board has been tentatively scheduled to meet 29 November 1977 to consider for retention all nonregular warrant officers whose current release date (i.e., completion of their 20th, 23d or 26th year AFS) falls in fiscal year 1980. Announcement of the board and rosters of personnel in the zone of consideration will be provided by a DA Circular 135-series that is now pending publication. If a decision is made to abolish the MTP effective with this FY 80 group, then the presently scheduled board would be cancelled. Instead, all FY 80 eligibles, plus all other warrant officers who have completed more than 14 years AFS, would be considered by the RA Selection Board. Selectees would then be tendered an appointment in the RA—thus making FY 78 their decision point. Nonselection for RA, or declination of RA appointment, would make the individual's current release date operative, except for personnel still in OBV status, who could apply for VI if they desire to serve beyond their OBV expiration date until completion of 20 years AFS.

POTPOURRI

WARRANT OFFICER SENIOR COURSE (WOSC): HDQA has scheduled the next WOSC Selection Board to meet 29 November 1977. It will select students to attend in 1979. Operation of the selection system is described in DA Circular 351-75 dated 21 July 1977. Preparation of the rosters of warrant officers eligible for consideration is currently in progress. All eligible personnel will be considered by the board. In addition, all previously selected warrant officers whose attendance was deferred will be reviewed by the board to validate their select status. It is anticipated that selection results will be published in January 1978.

FOR ALL:

QUESTIONS RELATIVE TO OER'S: Active duty officers and warrant officers with questions relative to the filing of OER's, status of OER appeals, or documents filed in their Officer Military Personnel File can now call 325-8792 for an answer. This is the number of the Personnel Records Division's 24 hour a day automatic telephone answering and recording service. Written or telephonic replies will be furnished to the caller within 5 working days.

ENGINEER PERSONNEL MANAGEMENT CONTACTS IN OPMD:

— Colonels Division (DAPC-OPC-AE)

Engineer Assignments, LTC Lin Lufkin, 7871

— Lieutenant Colonels Division (DAPC-OPL-AS)

Engineer Assignments, LTC Thomas Fisher, x0423

— Majors Division (DAPC-OPM-A)

Engineer Assignments, MAJ Gary Woodham x8109

— Combat Support Arms Division (DAPC-OPF-E) (Company Grade)

Engineer Branch Chief, LTC Norman Kuklinski, x0650

CPT Assignments, MAJ Mike Foster, x0651

LT Assignments, CPT Matt Dominy, x7434

— Warrant Officers Division (DAPC-OPW-AU)

Engineer Assignments, CW3 Frank Russell, x7837

If you cannot call, please write to the following address:

Commander
US Army Military Personnel Center
ATTN: (appropriate office symbol)
200 Stovall Street
Alexandria, Virginia 22332

In Defense of Germany

LTC Andreas F. Wittenberg

LTC Andreas F. Wittenberg is a graduate of the Armed Forces Staff College, and is an officer in the German Bundeswehr. LTC Wittenberg is presently back in Germany.

Cooperation between the Bundeswehr engineers and the United States Army combat engineers in West Germany is real. It is continuously practiced by units linked through "PROJECT PARTNERSHIP." This program joins a German "sister-unit" to each United States battalion. This special affiliation allows for common field exercises, joint training camps, and mutual exchange of experience. The United States combat engineer battalions practice and learn in a peacetime environment how to operate with their German partners.

Working together during the REFORGER exercises, between the Bundeswehr and the CONUS combat engineers, is a considerable challenge. The REFORGER units have been required to operate with units having an organization unfamiliar to them. In addition, both the employment doctrine and engineer equipment are different. This article is to help lessen the problem described. In doing so it will discuss;

- the main differences between the organization of the United States and Bundeswehr combat engineers,
- the methods of cooperation and
- the problems encountered during the transfer of obstacles

Organization of German Engineers

A Bundeswehr division has two types of combat engineers. As in a United States division there is an engineer battalion assigned to the division base. It has a headquarters and service support company, three engineer companies mounted on trucks, and a construction equipment and bridge company which carries the German floating bridge. The German amphibious bridge is located in the Amphibious Bridge battalion at Corps level. The commander of the divisional engineer battalion is "doublehatted." He is a special staff officer, "division engineer," on the division staff. In this role he advises the division commander on engineer matters.

In contrast to the United States Army Organization, the Bundeswehr brigade has a fixed organization with three combat battalions (Infantry, Mechanized Infantry, or Armor), an Artillery battalion and it's own organic combat support and combat service support companies. Included is an independent armed engineer company (Panzerpionierkompanie), mounted in M-113s and equipped with bridgelayers and combat engineer vehicles. The armed engineer company commander is also "doublehatted" and is referred to as the "brigade engineer" while performing his special staff functions. In addition, he is responsible to the division engineer and controls all engineer units which may be assigned to the brigade from the division.

Likewise, the division engineer reports to the Corps engineer (Pionierkommando) who commands the four to six engineer battalions in the Corps base.

All German divisions, in general, have more combat engineer units available than their American counterparts. However, German combat engineer units do not have a secondary mission to fight as infantrymen.

Doctrine of German Engineers

Both the United States and the German army combat engineers are responsible for assisting the movement of friendly forces and degrading enemy mobility by use of obstacles. The development of the barrier plan is based on the same tactical considerations:

- block the enemy's avenues of approach, but do not degrade your own mobility
- create obstacles where the terrain offers a chance to save munitions and manpower
- cover obstacles by direct fire and plan artillery fire where the attacker may mass in front of a barrier

In the Bundeswehr the barrier plan is proposed by the brigades and approved by the division. The plan is executed by engineers (however, other obstacles such as barbed wire entanglements may be created by any combat unit). Once an obstacle is in place both the brigade and division engineers will order the transfer of that item to an adjacent combat unit. All German combat units are trained to take over the responsibility for minefields. In addition, all infantry units are trained to detonate demolitions in road-craters and bridges or to create an abatis without assistance from engineers. Consequently, the rapid turn over of completed obstacles to combat units free engineer manpower to complete other projects, such as preparing barriers, to protect the flanks and provide barrier reinforcement of the terrain in depth.

The Wallmeister Organization

The basis for all barrier plans in Germany is a dense system of prechambered bridges and road-craters. These projects are normally initiated by the division engineers, approved by national and Allied authorities and executed by the Wallmeister Organization.

The Wallmeisters are a part of the German Territorial Forces, they are organized on an area basis. Usually, a Wallmeister group will cover one district. The district is further subdivided into several areas that subordinate teams of which three to four members will cover. These engineers know every route, bridge, possible bridge site or ford in their area of responsibility. The Wallmeisters control all barrier preparations in peacetime and are also experts in the possibilities that the terrain offers to create additional obstacles. They also assist German and Allied combat engineers in the use of German national resources such as sawmills, quarries and gravelpits. In addition, they have reconnoitered all power plants, dams, locks and water points in their region and can provide detailed information about them. They also can provide special maps and will assist NATO units in updating their maps.

The Wallmeister has the knowledge, expertise and capability to help the NATO engineer units accomplish their mission. The district chief engineer and his Wallmeister groups should be the first contact for an Allied combat engineer unit arriving in Germany.

Cross Attachment of American Engineers

Even though the cross attachment of German and American platoons or companies is not practical during wartime, it is common to practice PARTNERSHIP units. This procedure is best to create mutual understanding and achieve the experience in handling those little details in cooperation that could make the difference during a battle. Also, in Europe, it is a necessary and useful Allied custom to mix battalions or brigades of different nationality during field exercises.

If an American brigade is under the operational command of a Bundeswehr division, the American division engineer will assign a combat engineer company in direct support to that brigade. This engineer company will be reinforced with heavy equipment from it's own battalion base. Maintenance, supply and replacement for the engineer company must also be provided by the American

PROJECT PARTNERSHIP

engineer battalion. However, there is one exception to this rule. If the attached American brigade reinforces a German division in a defensive situation and is required to execute a German barrier plan, they can use German munitions. These munitions are warehoused in proximate stockpiles and identified for each particular mission. The logistical problem is solved, however a training problem is created. An American combat engineer company because of it's PARTNERSHIP experience will be skillful in the use of German equipment and munitions, but a REFORGER company will not. Consequently, REFORGER units must receive training in the use of German equipment and munitions or be provided with German advisors to assist them. In addition, the combat engineer company will be expected to act as a brigade engineer and render the same reports as his German counterpart. He will keep the German division engineer informed on:

- the status of obstacles(intention, initiation and completion).
- changes caused by enemy fire
- changes and additions to the barrier plan
- activities of enemy engineers
- his own engineer situation

Most of these reports are prescribed in the Division Field Standing Operations Procedures (**FSOP**) and some of them have been agreed upon by all members of NATO. The results of the agreement are included in the STANAG, e.g. DA-Form 1355 or STANAG 2036. Therefore, in this situation, it is imperative that the company commander contact the German division engineer, concerning the following:

- the combat engineer task
- the barrier plan and the target folders
- the limitations, restrictions and authorizations
- the munition storage plan, the keys of the munition bunkers and special passports
- the FSOP

Since both armies combat engineers are bound by the same STANAGs, Allied Publications (AP) and Allied Tactical Publications (ATP), with the exception of the munition problem, this type operation should flow smoothly. In addition, both armies feature decentralization of responsibility and authority and they both give mission type orders at all echelons. However, an exchange of liaison officers might be helpful.

Cooperation Across a Common Boundary

As noted earlier cross attachment presents some technical and logistical problems. However, it is the exception rather than the rule. Coordination of adjacent American and German combat engineer units across a common boundary will be a frequently occuring problem. It must be assumed that the aggressor will always seek out boundaries as weak points to attack. Corps and divisional commands emphasize coordination across these boundaries by the installation of coordination points. Normally, liaison teams will be available to exchange all current information. These teams are normally detached from combat units and are reinforced by forward observer parties and forward air controllers. Normally, combat engineers will not be included. Combat engineers may be attached if in the vicinity of the coordination point, there are important obstacles that need to be closed or fired by engineers.

There must always be close coordination between the engineer commanders of the two adjacent divisions. This is true, for two reasons, as it pertains to coordination and exchange of barrier plan information. First, since a boundary is an imaginary line, the battlefield will not necessarily end where responsibility changes. The possibility that elements of the one nationality may become dispersed or may be forced by the enemy to withdraw through the area of the other must be considered. Insufficient information about the barrier situation on the other side of the boundary could endanger friendly troops. The barrier plan information should cover an average area of 10 kilometers on both sides of the boundary. This could be accomplished by sending information copies of the regular barrier reports to all concerned, by liaison officers or liaison teams at coordination points. Secondly, the shortage of combat engineer troops forces austere measures to be taken. In other words, one minefield may be sufficient to protect the flanks of two adjacent divisions. The necessity to maintain contact between two adjacent engineer battalions or division engineers is very important but difficult to achieve. The headquarters of the battalions are often located too far from each other to maintain radio contact. In addition, the "official communications channel" is ineffective because the traffic travels from the U.S. combat engineer battalion to the U.S. division — U.S. corps — Allied Army Group — German corps — German division to the German engineer battalion. It is also unwise to rely on the use of courier-officers between the adjacent division headquarters, because there is no regular schedule for them. An adequate way to communicate seems to be with the use of the point-to-point telephone line, which is usually installed between adjacent division headquarters. However, the division engineer has to share this communication line with all members of the division headquarters. A better way to accomplish the task is to exchange liaison officers with the appropriate communication equipment. The liaison officers can become the eyes and ears for their commanders and will have a personal interest in transmitting their messages and collecting information. The liaison officers can save time because they will be able to immediately answer most questions.

Cooperation During Relief in Place

The most serious problems in cooperation of U.S. and German combat engineers occurs during a relief in place. This relief can be caused by a complete change of fighting divisions or by a small shift in the corps boundary.

If an American combat unit assumes the responsibility for a certain defense area from a Bundeswehr unit, there will be some obstacles that must be transferred. The responsible division engineers will be consulted by the planning staffs. The following steps are necessary:

1. The outgoing engineer commander is responsible for informing the incoming engineer commander about the actual barrier situation by means of the barrier plan. This briefing should include:

- location, current status and markings of completed barriers
- units responsible for the obstacles
- officers authorized to close or to fire
- obstacles not completed
- planned obstacles
- prestocked munitions
- tactical purpose of each obstacle

2. This information will assist the incoming division in making the decision on how to fight the battle in the transferred area. Based on that decision a warning order will be sent to the engineer units to effect the transfer of the obstacles.

3. A representative for both the incoming and outgoing engineer unit will meet to coordinate the transfer. They will normally discuss the following items:

- the schedule for the transfer
- methods for the delivering unit to recognize the correct receiving unit (authorization)
- how to report the completion of transfer

The outgoing engineer delivers the target folders for planned obstacles and the updated barrier plan. It is recommended that the headquarters be collocated until the transfer is completed.

Transfer of Minefields

The transfer of minefields is facilitated by the use of the NATO standardized DA Form 1355. The form contains most of the data the incoming engineer unit needs to know and is prepared in five copies. One copy should go to the unit that has the responsibility for the minefield (this is the copy that will be transferred to the incoming American engineer unit); the second copy will remain at the German engineer company which created the barrier; the third and fourth copies will be forwarded by the German division and corps engineers to their American counterparts; and the fifth copy will be forwarded through the official channels to the highest national authority.

The minefields will be established with German mines. Consequently, if a lane is to be closed by the incoming American unit, the unit must be trained in the use of German mines. This will present a problem for REFORGER combat engineer units. Therefore, it is recommended that these units close the lanes with American mines. However, this must be noted on the DA Form 1355 and be sent through channels so that all other copies of the form may be updated.

During the transfer, the American unit should also be prepared to install it's own lamps and signs because the German engineer units will probably take their equipment with them.

Bridges, Roadcraters, Abatis

If charged demolitions must be transferred additional problems can be expected. If a target folder is used it should contain a demolition plan which can facilitate the translation. Another aspect of the problem is the incompatibility of equipment. For example, the Bundeswehr engineers use a different blasting machine and firing wires of different rheostat than the Americans. They usually use a combined electric/nonelectric firing system. They also use a primer cap which is not used in the American army. American combat engineers using the German system would experience difficulties in testing the functional capability of the system, in arming the system (safe to armed) and finally in firing it. If additional training is not possible, the best solution would be to replace the German firing system with the American system.

Most demolitions require additional mine-laying to close gaps around the created obstacle and to hamper the enemy engineers attempt to breach it. The German mines would have to be changed if the American unit has not been trained in the use of them.

The Language Problem

With very little training experienced engineers would be able to cope with the differences in the Allied equipment. However, the problem which will defy a satisfactory solution, even for trained engineers, is the language. The actual transfer of obstacles will be handled by platoon leaders. The average German platoon leader does not speak sufficient English, and the average American platoon leader, in spite of the recent language training programs, does not speak enough German.

As mentioned above, the DA Form 1355 or the NATO target folder will be used during the transfer procedure. The present version of the form that is used in the Bundeswehr is bi- or tri-lingual; thus, some help is at hand.

A big improvement would be to develop a multilingual transfer folder. Since the transfer MUST be completed by a written receipt, why not use that to report all significant information on a bilingual checklist? This form could assist in solving other problems. For example, it could provide the incoming engineer some type of authentication recognition. The delivering platoon leader would know that the soldier in a different uniform asking him for his blasting machine keys is in fact the authorized person. The recognition of his battalion or brigade commander signature on the transfer folder would solve this authentication problem. Another problem that could be solved with the proposed transfer folder is that of authorization to fire a demolition. Field manuals for both armies say that the outgoing commander is in command during the relief in case of an enemy attack. However, the incoming American engineer platoon leader will have a STANAG 2017 Annex A (Orders to the Demolition Firing Party Commander) signed by the incoming American brigade commander and installing a chain of command for each particular demolition. But, this order remains invalid until the relief of the entire area is completed and the responsibility has been formally turned over to the incoming brigade commander. It would be an ineffective solution to provide STANAG's 2017 Annex A, just for the time of the relief. Therefore, the transfer folder would be an appropriate vehicle to fill the gap. The outgoing commander could use it to order the outgoing engineer unit to transfer it's firing orders. Likewise, he could direct the incoming engineer unit to use the firing orders of it's predecessor for a limited time or until it receives orders to destroy it. Then the incoming American combat engineers would use the new orders. It is obvious, that a decisive and irrevocable order as the order to fire a brigade must be given in written form. Thus, the transfer folder would be the most simple method during the relief in place.

Summary

If the NATO forces in central Europe are attacked the task performed by the combat engineers will undoubtedly be the key factor that will allow those forces to hold until reinforcements arrive. Thus, the cooperation between the American and German combat engineers is imperative. Even though the problems discussed in this article were focused on the relationship between the American and German engineer units they are equally valid for other NATO combat engineer units that will be employed in Germany. Consequently, we cannot afford to wait for high level solutions to the problems, we must act now because **interoperability must be achieved prior to hostilities.** The solutions to these problems can be achieved through cooperation and training at the working level. Therefore, all combat engineer units entering Germany should be encouraged:

- to contact the district chief engineer and his Wallmeister groups
- to take advantage of all opportunities to become experienced with German mines and demolition equipment
- to make quick contact with adjacent German engineer units to confirm agreements of cooperation

STOPPING AN ARMORED ATTACK

COL Jerome B. Hilmes

A dreadful roar filled the valley, inspiring awe and fear in the men who waited in silence on the slopes. Eyes strained to pick up the first movement, but smoke and fog combined to frustrate detection. The roar was louder now, the clatter of the tracks discernable from the heavy whine of the engines. Then through patches of haze they came into view — dozens of enemy tanks, wave upon wave, screaming down the small valley in a violent and headlong dash to their objective at the other end. At their high rate of speed, they would be past the defenders in a matter of minutes. There were so many, they literally filled the valley. Could they be stopped?

The defending Task Force opened fire first with their M60A2 and M60A1 tanks, then with their TOWs and Dragons. Where were those Cobras? The enemy force was moving too fast, their numbers too great. Their momentum had carried them to within hundreds of meters of the foremost defenders. Then they hit the ditch.

The surprise was evident; the ditch had not been reported by their reconnaissance parties the night before. Some stopped, looking frantically for a gap. Others probed the ditch, some cautiously, some aggressively. Succeeding waves came to a halt — keeping a distance from the previous wave, not bunching up — a tribute to their discipline. It became a turkey shoot now, the defenders continued to pour down their deadly fire. Now the artillery was coming in with devastating effect. Some tanks tried end runs, but the ditch sprawled across the valley floor, leading them to death at point blank range on the flanks. A few tanks broached the ditch; their bare bellies rising high in the air as they cleared over the mound of spoil. They were inviting and vulnerable targets to the expectant anti-tank gunners. The area had become a killing zone. The engineers had done their job.

Stymied by the ditch and decimated by direct and indirect fire, the attackers moved back with a final burst of smoke. Once again the defenders strained for visual contact. The artillery was called off. The Task Force began to move to maintain contact. Now the TOW-Cobras came to join in the pursuit. The whole encounter lasted but for a few minutes — quick and deadly. The careful planning of the Task Force Commander had paid off with a successful defense by his combined arms team — armor, infantry, artillery and engineers. They had fought and won the first battle of the next war.

The description of the above "battle" (with a little poetic license) was typical of a scene repeated several times by the forces of the 3rd Armored Division at Hohenfels in the summer of '76. Maneuver battalions and the divisional engineer battalion were "taking their ARTEPs." The ARTEP (Army Training and Evaluation Program) provided these battalions the opportunity to demonstrate their training in a combined arms environment under the scrutiny of evaluators. The "enemy" was the divisional Armored Cav Squadron reinforced. The artillery was simulated as was the "deadly fire." The ditches were real, as was the laughter of the engineers on the slopes as they watched the armored attacks growl to a halt. The ditches had not been there the "night before," but were constructed across the 400-600 m valley in the early hours of the operation while the opposing forces were reconnoitering farther to the front. The training benefits were numerous and significant.

BANG! That vulnerable belly is exposed 6 to 10 times during a crossing.

ATTACKING THE DITCH BY RAMMING. The gun is slewed. Ditch is too deep for enemy to turn it into a dug-in firing position.

Benefits of Anti-Tank Ditches. Some of the salient advantages of this easily-constructed obstacle are:

- Minimum logistic support required (vis-a-vis a minefield for example). We employed a D-7 dozer and 2½ CY scoop-loader team. With full fuel tanks they can work all day or all night. No big haul requirements.
- Puts a physical obstacle where there was none, converts an open avenue of approach into a kill zone, or can serve to channelize the enemy. It can be emplaced during times of tension without danger to the civilian populace.
- Strips away enemy mine-clearing attachments (i.e. plows and rollers). Therefore, the anti-tank ditch is especially effective when combined with mines on the friendly side — a real combat multiplier.
- Great for peacetime training — no need to simulate.

Combined arms team learns to appreciate the capabilities of one of its members — the combat engineers.

Team acquires the good habits of coordinating the location of obstacles, direct and indirect fire plans, security and logistic support. SOPs are developed, CEOIs are checked, signals agreed upon.

RECTANGULAR ANTI-TANK DITCH are better than triangular in clayey soil, but tougher to counter attack across.

Engineer capabilities become a vital part of the technical plan in both defense and offense. The defending commander plans his defense largely around emplacing the obstacle/barrier. "How long will it take to get that ditch across the valley? How many mines can we get behind it? We need it by BMNT!" Similarly on offense — "When we counterattack, put those CEVs and tank-dozers up front to breach that ditch ASAP."

During the ARTEPs, engineer resources were in constant demand by both the aggressors and the defenders — as it should be! The anti-tank ditch made believers out of the maneuver elements. No armored force worth its salt would stop in full attack for a strip of white "engineer" tape. But they don't run over an anti-tank ditch.

Planning Factors. Time of emplacement will vary with type of soil. In the rocky, clayey soil at Hohenfels, we found that two dozer scoop-loader teams (4 vehicles) could dig 400 to 600 m of ditch in 2-3 hours.

The deeper the ditch the longer it takes a tank to defeat it (by ramming the walls and breaking them down). A 1.2 m rectangular ditch provided a good two minutes of delay; a 1.5 m more gave about five minutes. The tactical play of the problem usually limited us to shallower depth because of the press of time. In the counterattack, the ditch delays the friendly force by about a minute. Less, if CEVs and tank-dozers are up front to breach by pushing in the spoil.

Conclusion. The anti-tank ditch is not the answer to the combined arms teams's prayer; it does not have (by itself) the awesome lethality of a minefield, nor is it as formidable as a blown multi-span bridge at flood-tide. It is an important tool for the combat commander and his engineer. It is a combat multiplier that can turn the tide of battle. It is the most realistic peacetime training obstacle that the combat engineer can provide for his combined arms team. Use it — you'll have fun!

COMPUTERS FOR THE ENGINEER COMBAT BATTALION

John E. Burke

The computer age has been with us for more than a quarter of a century. The minicompter has stormed the markets during the last ten years. The Artillery, Signal, the Adjutant General, Finance, and the Quarter Master Corp, and others are well ensconced in the automation of their work. Where are the Combat Engineers?

There are Combat Engineers who don't appear to believe that the computer age is here to stay. Others don't believe the computer can be trusted to calculate the answers to mathematical problems without human intervention. There are some who believe they can do those calculations just as fast and accurately with the hand held calculator. Then there are others who feel Engineers should not jump on the band wagon of every new development on the market. In an age in which computers do calculations with electronic speed, military engineers must influence the action by identifying what is needed. This isn't to say that there have not been efforts to automate the engineer battalions in the past. In fact, at the urging of the Engineer School, a battalion minicompter was fielded in 1972 for testing with the 24th Engineer Group in Germany. The test was incomplete because the computer was not really tested at the battalion level. It was found however, that the need for a computer at the Engineer Group was a must, but the project died.

Currently through the efforts of the TRADOC Engineer, a WANG minicomputer is to be tested by the 20th Engineer Brigade at Fort Bragg, N.C. to determine its usefulness in the Engineer Combat Battalion. Two WANG computers were delivered to the Engineer School on 8 April 1977. They are being shaken down. Programs are being written. Operators and systems analysis are to be trained in Basic Language and other subjects associated with the use of these computers.

The Armor Engineer Board is charged with preparation of the test; the Engineer School with the writing of programs and documentation and the 20th Engineer Brigade with the actual field testing. The Engineer School will monitor the programs, making corrections as the battalions in the field identify the need.

The minicomputer can be used also for tasks performed by Combat Battalions that require computations. Some of these tasks are planning for minefields, barriers, and river crossings. The minefield program could identify various densities for anti-vehicle and anti-personnel mines, keeping track of the number of each type needed, and the number of each available and provide several options within the resources. The barrier program would do the same thing with the added features of providing information on the various materials available, the amounts available and the amounts needed to include transportation requirements. The river crossing program could keep track of river crossing resources, where they are located and the numbers of crossing vehicles needed etc.

There are other areas of application such as input data preparation for Siderpers, CSSS and other systems. The minicomputer could be used to update and print recurring reports, and to prepare requisitions for the S-4. It could be programmed to punch cards, used by many army systems as input media, thereby eliminating an error prone middle man key punch operator. Some will say that minicompters used in such roles conflict with or duplicate other systems. Actually it would improve the input to these systems by elimination of the intermediate steps that breed errors. The minicomputer can be handled by anyone with little or no prior computer experience. The programs are generally written in a computer language called Basic. Officer attending the Advanced Course at the U.S. Army Engineer School have at least a working knowledge of the language. Most programs will be on the minicomputer when it arrives at the unit. The only modifications that might be needed would be those to suit the tasks of the individual commander or staff. Maintenance of computer equipment is usually by replacement such as in the Tacfure system where defective components are isolated and the entire defective circuit board is replaced

The testing of the WANG minicompter will probably duplicate a lot of the work done in 1972, but the movement is a step in the right direction. Hitching our future capabilities to the WANG mini should not be the aim of the test. The aim is improving the status quo by using a minicomputer which would increase our usefulness as military engineers and place us in the position of being able to provide our input to tactical plans with speed equal to that of the other branches, as well as an ability to probe more options.

What is needed now is an objective look at the possible applications by the Engineer Combat Battalion in the field and to make these uses known to the Combat Developments Directorate at the Engineer School. Whether engineer battalions have access to a computer or not, their ideas on the various uses for a minicomputer should be useful for this test.

How the minicomputer can be utilized best still requires some thought and imagination on the part of military engineers everywhere. Its applicability to engineering design problems is obvious. Where it may take several hours, days, weeks or months to complete a design project, a good computer program can generate several different design options in a matter of a few seconds, minutes or hours depending on the complexity. Its uses in construction management are also well understood and used today by civilian firms and other services. (The Navy provided minicomputers to two of tis C.B. Battalions more than a year ago.)

The minicomputer is not a multimillion dollar monster that occupies a room the size of a gym, which requires air conditioning, Mega Watts of power and a babysitter. On the contrary it is amazingly small, occupies about a 3' x 5' desk top and runs on a regular 110 volt current. It can operate in the same temperature range in which the human body can operate comfortably. When not in use can be turned off with little fuss than is normally experienced with a well behaved electric typewriter. The cost? Well, that like buying a new car — it depends on the options. For engineer needs the cost would probably run between $15,000 and $30,000 each.

Mr. John E. Burke retired from the U.S. Army Corps of Engineers as a Lieutenant Colonel in June 1960. He joined the U.S. Army Engineer School as an instructor in Construction Management. He introduced CPM, PERT, Automatic Data Processing subjects and other management tools into the school curriculum.

He has served as Chief of the Engineering Management Branch, Department of Military Engineering since December 1964 to date. He has been the recipient of many outstanding awards and the second higest civilian award—the Civilian Meritorious Service Medal for his contributions to the Engineer School.

He is a graduate of the George Washington university, holding a Bachelor of Arts degree and a Masters of Science in Public administration with area of concentration in Automatic Data processing.

RESTRUCTURED ARMORED DIVISION

[illegible]T Stan Gray

The divisional engineer battalion has long played a vital role as a key element in the combined arms team. Within our capacities, as dictated by the organic engineer equipment present in the various type divisional engineer TOEs, we offer a wide range of capabilities to enhance the effectiveness of fighting units. However, recent advances in warfare technology have stimulated much reflection on our combat engineer system and how it can best contribute to the battle. The results of such reflection can be seen in examining the restructed Armored Division and its reconfigured engineer battalion, to be tested later this year at Fort Hood, Texas.

The recognized need for a restructured division lies in the dramatic changes in the complexion of the modern battlefield brought on by the continuing development and refinement of materiel, tactics and techniques by NATO and Warsaw Pact forces. This translates into heightened mobility with an emphasis on quick penetrations and shock effect; increased firepower due to massed armor formations and improved weapons technology; greater need for cover and concealment to avoid detection by more sophisticated surveillance systems; a lethality of weapons systems previously incalculable, and a war or conflict of possible short duration (prompting the "win the first battle" philosophy which dictates our current doctrinal re-evaluation). The proposed division features a greater number of smaller sized maneuver battalions with additional firepower integral to the division. It is an attempt to optimize and integrate the new weapons systems coming into inventory with the tactical concepts for modern warfare, The ultimate goal is to maximize firepower forward at the right place at the right time.

To assess the engineer role in this changing battlefield scenario, we will look at it through the conceptual framework of the division combat engineer system. This combat engineer system is comprised of all divisional and corps engineer units located in the division area. It contains those skills and equipment necessary to enhance the division's mobility, survivability, to counter mobility of opposing forces, and to accomplish general engineer work in the division area. The combat engineer system must be employed as far forward as possible to enhance the ability of the maneuver battalions to meet any engagement successfully. This calls for highly mobile engineer units with a capability of providing a flexible, quick, and effective response. Speed is of the essence! Modifications to the organic equipment found in the proposed divisional engineer battalion, as well as altered organizational structures, reflect this flexibility and mobility. At the same time, the lethality of the engineer system has increased significantly. This will be examined in more depth later in the article.

The principal missions of the division combat engineer system are: MOBILITY, COUNTERMOBILITY, SURVIVABILITY, and GENERAL ENGINEERING.

MOBILITY: Reducing or negating the effects of natural or manmade obstacles to improve movement of maneuver units and critical supplies. The mission demands quick and expedient methods to clear the way. The combat engineer vehicle (CEV) must be well forward, particularly when fighting in built-up areas. The complete removal or reduction of large obstacles will be the responsibility of follow-on engineers; the forward engineers must keep pace with their supported maneuver units to ensure continuous mobility.

COUNTERMOBILITY: Impeding the enemy, providing time, space and protection to friendly forces through the employment of obstacles. Although some obstacles are designed to destroy targets, most will be to enhance or complement other weapons systems. With the advent of the Family of Scatterable Mines (FASCAM), the nature of obstacle employment has been significantly altered. The most effective means today and in the forseeable future of achieving countermobility is by reinforcing the terrain through the use of mines. Other obstacles producing means are planned for and emplaced as time and available resources permit; however mines are the single most effective means. The limited number of infantry and armor troops actually available in the emerging division organization to accomplish all combat missions demands that engineers must assume added responsibility in countermobility tasks. FASCAM makes this possible. (Figure 1) FASCAM provides "dynamic" obstacles having specific active lives before self-destruction which can be delivered in front of an advancing enemy by helicopter, ground dispensers, artillery, rockets, or ground units. It must be remembered, however, that FASCAM will not obviate the need for conventional minefields and other obstacles. The planning for and advice on the employment of **all** mine systems will still be the responsibility of the engineer, regardless of the method of delivery or execution.

Countermobility will also be achieved by the contruction of strongpoints to deny key terrain to the enemy. Strongpoints may be platoon to battalion size, and the engineer must in their rapid preparation.

SURVIVABILITY: the development of protective positions. Engineers will provide the technical assistance and equipment to the forward

FASCAM CHARACTERISTICS

SYSTEM	DELIVERY	APPROX. MINEFIELD SIZE
M56	HELICOPTER (UH1H)	20 x (100 to 300) METERS PER SORTIE
ADATM/ADAPM	155 MM HOWITZER	250 x 350 METERS PER 12 ROUNDS
GEMSS	TOWED DISPENSER	60 x 1000 METERS PER LOAD
SLUMINE	ROCKET ON M548	300 x 1200 METERS PER 30 TUBES
GATOR	NAVY/AF AIRCRAFT	ALTITUDE AND SPEED DEPENDENT
MOPMS	HAND	35 x 75 METERS

ADATM: ARTILLERY DELIVERED ANTI-TANK MINE
ADAPM: ARTILLERY DELIVERED ANTI-PERSONNEL MINE
GEMSS: GROUND EMPLACED MINE SCATTERING SYSTEM
SLUMINE: SURFACE LAUNCH UNIT MINE
MOPMS: MODULAR MINE PACKED SYSTEM

FIGURE —1

divisional units in creating defilade positions and protective shelters. Due to improved surveillance techniques possessed by the enemy, proper camouflage and concealment become more critical than ever before. The active defense will require the engineers to provide for quick, yet well concealed movement within friendly lines. To maintain favorable combat power ratios, the survivability of vital weapons systems and personnel must be ensured. The upcoming Universal Engineer Tractor (UET) will provide engineers with a must more responsive and less vulnerable earthmoving capability for digging in units. Since the emphasis of division engineer units will be on the preparation of forward defenses, corps engineer assets must to tasked to dig in the remainder of the division area.

GENERAL ENGINEERING: providing support to units and activities in the brigade and division rear areas. This will be the prime consideration of corps engineer units. Among their duties will be maintaining essential supply routes, replacing assault or blown bridges with tastical bridging, installing POL pipelines, conducting ADM missions, and developing forward support areas for rearming/refueling.

Although these are the "engineering" missions of the division combat engineer system, engineer units also have the mission to fight as infantry. This has been and continues to be, one of our missions. However, due to the loss of essential engineering capability in the division forward area, engineers should be committed as infantry only when the tactical situation deems it necessary. Such occasions are more probable in the defense than in the offense. The engineer unit has limited inherent fire power (the main anti-tank assault weapon system will be the M47 DRAGON, assigned two per line platoon). This calls for further augmentation from division assets such as indirect fire support, forward observers, tanks, and additional anti-tank weapons. It is more likely that specific engineer companies or elements will be committed to infantry combat operations of limited area/mission, rather than the entire battalion as a unit, and unit integrity will be maintained.

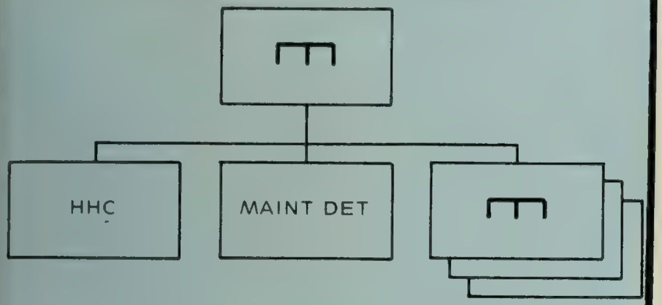
Now we will analyze the actual division engineer organizations as they will be tested in the restructed Armored Division. The 1977 model (Figure 2) is based on equipment and weapon systems presently found in the engineer inventory, reconfigured to best accomplish the missions of the division combat engineer system. The 1980's Figure 3 model illustrates the integration of several currently-projected weapon systems and items of equipment to be fielded after 1980.

Analysis of the two models indicates a number of salient features about the engineer organization's future capabilities and concept of operation. Major aspects of change include:

The elimination of a bridge company and some heavy equipment items currently found in the TOE 5-145H series. Except for the AULB, all bridging and rafting capability has been shifted from the division combat engineer battalion to Corps units. (Each armor battalion in the heavy

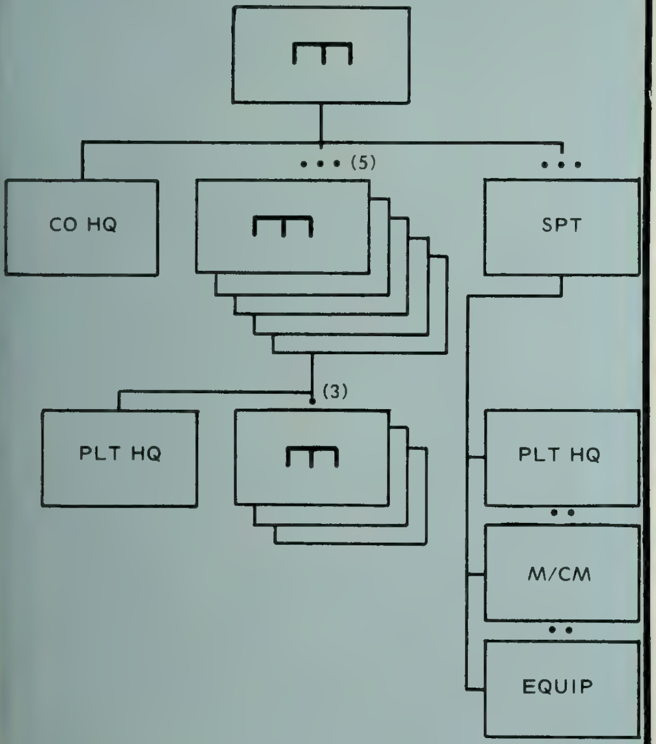
1977 MODEL

ENGINEER BATTALION TOE 5-835T



PERSONNEL	OFF	WO	EM	AGGR
BATTALION	37	1	731	769
MAINT DET	1	2	101	104
TOTAL	38	3	832	873

ENGINEER COMPANY TOE 5-837T



PERSONNEL	OFF	WO	EM	AGGR
	8	0	203	211

SUPPORT PLT M/CM SEC
2 AT MINE DIS (M57)
1 AVLB
3 CARRIER M548
(2 M173 ROCKET PROPELLED LINE CHG)

EQUIP SEC
1 TRACTOR D1
2 LOADER 2½ CY
2 BARRIER

CO HQ
CARRIER M577

5 ENGR PLT
15 CARRIER M113
5 LOADER 2½ CY
10 DUMP TRUCKS
5 CEV
5 D7 DOZERS
5 10T TRACTORS
5 25T TRAILERS

FIGURE — 2

division has two AVLB's.)

A slightly lower battalion strength (the present TOE 5-145H level I personnel strength is 984 men), yet considerably larger company-sized units.

Reconfiguration to three line companies, each having five line platoons and one support platoon. A line platoon will have three 8-man squads. This has been done to facilitate the integration of engineer capabilities with the proposed five maneuver battalions of a heavy division brigade. It allows normal association of one engineer platoon per maneuver battalion, thus enhancing the relationship with the integration of division engineer units and their maneuver unit counterparts. The engineer assets may be shifted at any time to meet critical situations within the division forward area. The support platoon, divided into a mobility/countermobility section and an equipment section, will provide needed equipment and systems to the line platoons on a task basis.

Lessening of generalized engineering roles for the divisional combat engineers. In the mobile battlefield, particularly the active defense, the volume of engineer tasks in the forward area, demands the utilization of all engineer assets in a direct support role. (Engineers will be attached to maneuver units only when time and/or distance factors prohibit control by the parent engineer unit.) Corps engineers will undertake most general engineer missions in the division area. As a result, a minimum of two Corps combat battalions can be expected to be located forward of the division rear boundary; an additional Corps combat battalion and one combat heavy battalion in the Corps area will be allocated for each committed division. However, there will be only one point of contact for all engineer systems employed in the division, the division engineer.

A more specific role in mobility/countermobility. The addition of GEMSS, SLUMINE/SLUFAE, and the UET in the 1980's will further enhance the engineers' capabilities to perform this mission.

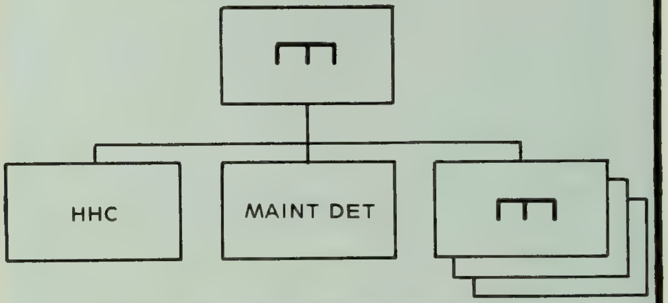
An increase in number of CEV's to the line companies, for enhancing defense, assaulting fortified positions and bunkers, clearing rubble and other obstructions, and for limited slot dozing.

Greater cross-country mobilit of engineer units, primarily with the addition of the UET. This will allow the engineers to keep pace with the maneuver elements with improved survivability. Although dozers, bucket-loaders, and dump trucks possess cross-country movement capability to some degree, they do put constraints on the mobility of engineers units. The UET of the 1980's model greatly solves the current problem.

The consolidation of all battalion organization maintenance under an Ordance Maintenance De-

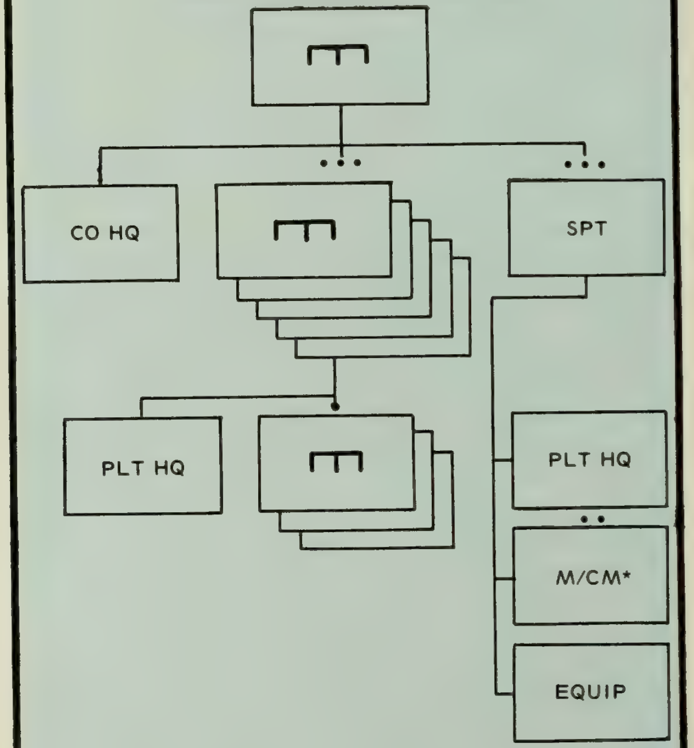
1980's MODEL

ENGINEER BATTALION TOE 5-835T



PERSONNEL	OFF	WO	EM	AGGR
BATTALION	37	1	704	742
MAINT DET	1	2	94	97
TOTAL	38	3	798	839

ENGINEER COMPANY TOE 5-837T



PERSONNEL	OFF	WO	EM	AGGR
	8	0	194	202

SUPPORT PLT M/CM SEC
2 SLUFAE/SLUMINE
2 GEMSS
1 AVLB
3 CARRIER M548

CO HQ
CARRIER M577

EQUIP SEC
1 UET
2 LOADER 2½ acy
2 EXCAVATORS**

5 ENGR PLT
15 CARRIER M113
10 UET
5 CEV

* M/CM — MOBILITY/COUNTERMOBILITY
** PRECISE CONFIGURATION/NOT YET IDENTIFIED

FIGURE — 3

tachment, whick will retain company support teams for the engineer companies. Company team maintenance operations will be limited to organizational services, minor repairs, battlefield recovery, and evacuation.

The removal of all water purification teams from the division engineer battalion. Supplying potable water to the division will be the responsibility of DISCOM elements, supplemented by the Corps of Engineers Water Supply Company as needed.

Removal of the equipment platoon from the headquarters and headquarters company of the division engineer battalion made possible by the addition of a support platoon to each line company, and the removal of most heavy equipment from the battalion.

The removal of all Atomic Demolition Munitions (ADM) missions from the division engineer battalion. This responsibility will be assumed totally by the Corps ADM Company.

The addition of a division support element from the theatre army topographic battalion, collocated with the ADE at division headquarters. This element will be responsible for providing military geographic information to the division.

Brief mention should be made of the several new weapon systems and equipment items to be introduced in the 1980's as organic to the division combat engineer battalion. This will serve to enhance the reader's perspective of the vastly expanded capabilities and combat engineer system will soon possess.

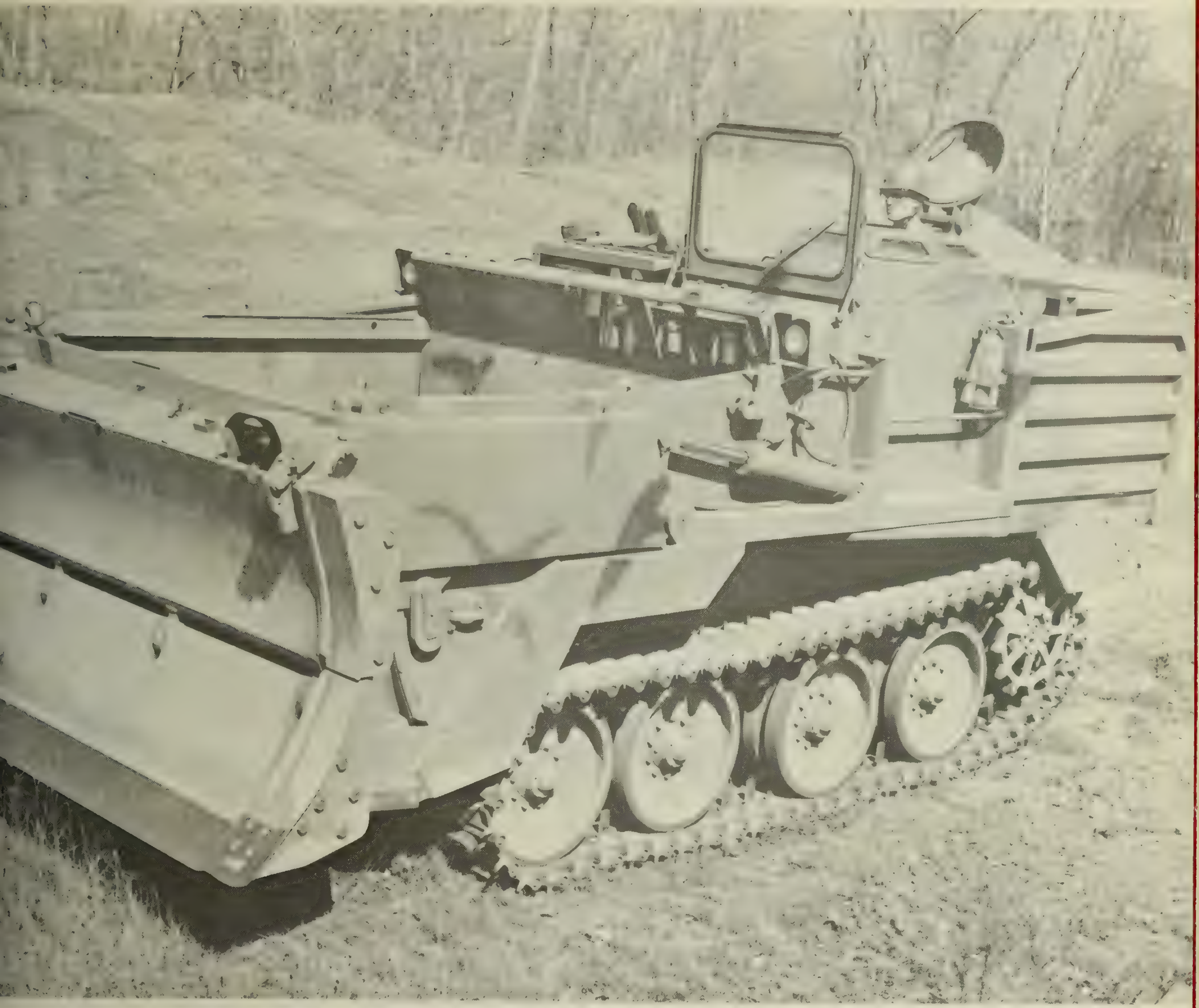
SLUFAE: A fuel-air explosive which will increase the engineer's capability to rapidly breach minefields and enhance maneuver, and to attack bunkers and built-up areas. A launcher containing 30 tubes will be mounted on the M548 cargo carrier. It has a maximum range of 1,000 meters and breaches a path 8 meters wide by up to 300 meters long.

SLUMINE: A dynamic mine emplacement system capable of placing self-destructing mines into enemy-held or contested terrain. SLUMINE utilizes the same launcher as SLUFAE. With a delivery range of up to 5,000 meters, SLUMINE is capable of emplacing a minefield 300 meters by 1,200 meters with a single salvo. Thus it provides the engineer the ability for very rapid mine-laying response to a critical tactical situation. This system should be fielded in 1981; there is no present substitute for SLUMINE.

GEMSS: A system which will rapidly emplace anti-tank and anti-personnel mines in areas controlled by friendly forces. Mounted on a modified M-794 trailer, (see below) GEMSS consists of a drum containing 800 mines, and can lay a minefield strip 60 meters wide by 1,000 meters long per drum load within 15 minutes. Minefield composition can be pre-set by the loader(s).

MOPMS: A mine dispensing system for hasty protective minefields, to close gaps and lanes, and to point mine obstacles. MOPMS will be part of the basic load of all units, and is expected to reach the field in 1982. Each box will contain 20 anti-tank and 10 anti-personnel mines, designed to create a minefield up to 35 meters by 70 meters.

Other FASCAM systems expected by the 1980's, not organic to division engineer units but which come under the planning guidance of the engineers, include ADAPM/ADATM and GATOR. These systems all utilize self-destructing mines delivered by artillery or high performance aircraft. The M-56 helicopter-delivered mine dispensing system, currently available, will also be continued.

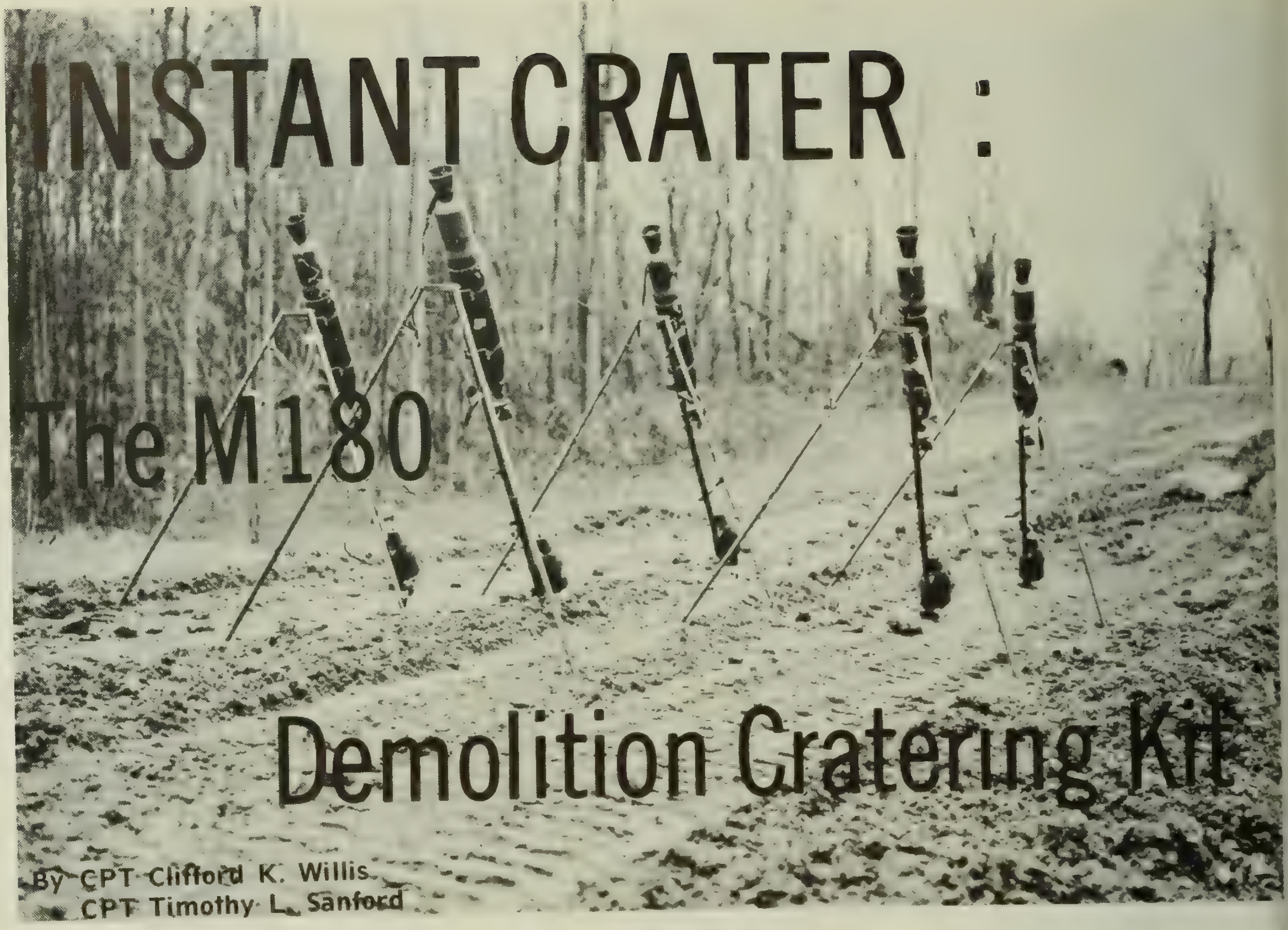


UET: Will provide a highly mobile earthmoving capability, used for the preparation of battle positions and strongpoints, and for improvement of combat routes and trails. It will replace the scooploaders and dump trucks in the line platoons, and the D7 dozers in the support platoons. The UET will make the engineer platoon of the 1980's more compatible with the maneuver task forces for cross-country movement.

There is no guaranttee that the restructured Armored Division in its present untested form has optimized the full capabilities of the various weapons systems and organizations comprising the combined arms team. Only with extensive evaluation, field testing and adjustments to the structure, will that question be answered. Likewise, there may be modifications made on the division combat engineer system, as it has been defined and described in this article. Some real issues to be evaluated include command and control relationships between supporting and supported units, interaction of corps and division engineer assets (with corps now retaining almost all bridging capability), and the degree of mobility-countermobility-survivability afforded by the engineers. These questions will take considerable time and extensive field-testing to be accurately answered. What can be guaranteed, however, is that the combat engineers **will** continue to influence the course of future battle.

INSTANT CRATER:

The M180 Demolition Cratering Kit



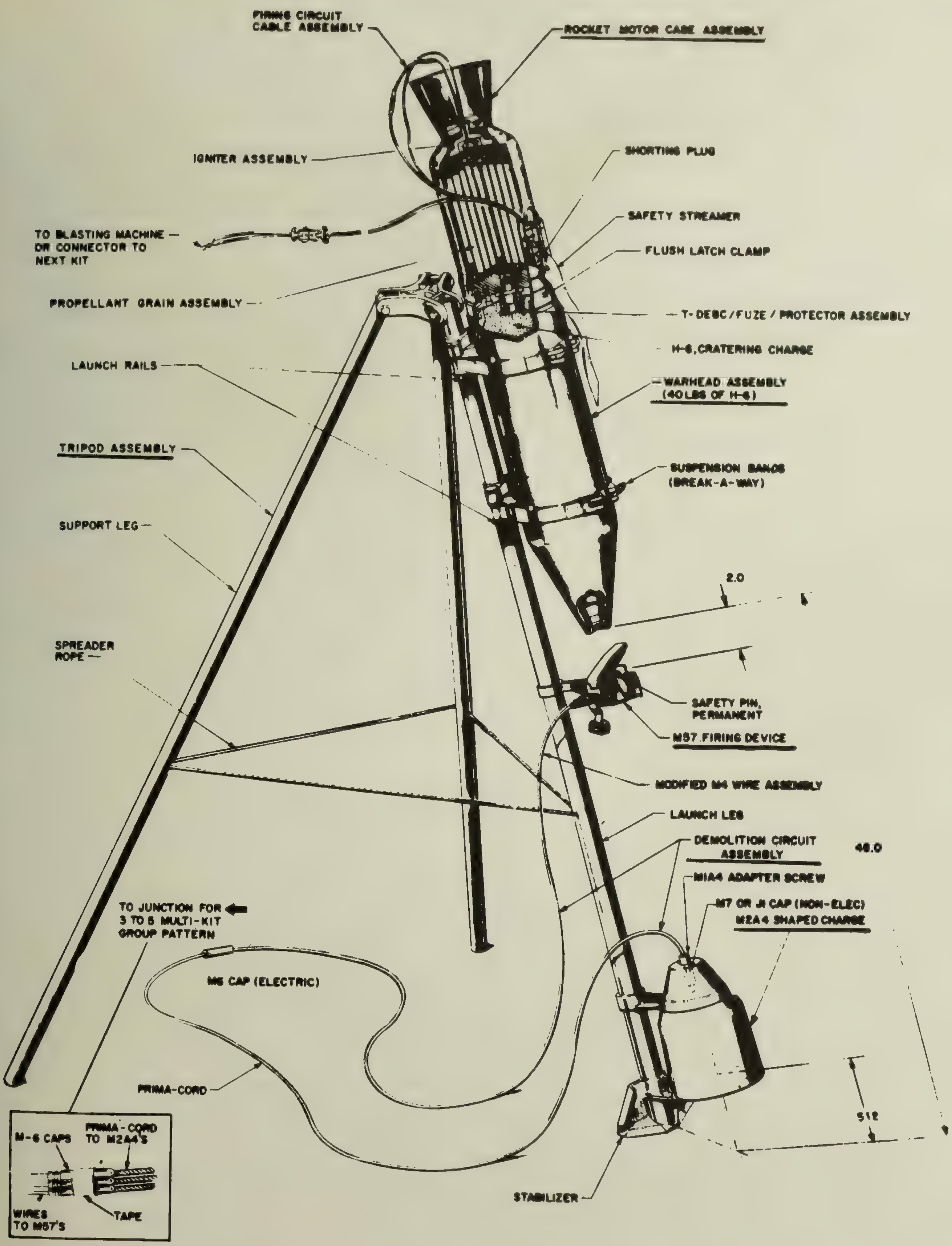
By CPT Clifford K. Willis
CPT Timothy L. Sanford

Late this year the most significant development in engineer obstacle support capability since World War II will reach field units. The M180 Demolition Cratering Kit will provide a rapid means of creating craters in any surface. A two man team can effectively crater a 30' roadway in twenty five minutes using the M180 Kit; a task which normally takes a full engineer squad more than two hours to complete.

The M180 Demolition Cratering Kit consists of an M2A4 shape charge, an M57 electric firing device, a warhead, a rocket motor, a tripod and a demolition circuit (Figure 1). The shape charge, firing device and warhead are permanently attached to the launch leg of the tripod; the rocket motor and demolition circuit are connected during emplacement. Ignition of the rocket motor starts a chain reaction, moving the warhead down the tripod leg, actuating the firing device and, in turn, initiating the demolition circuit of the shape charge. The rocket motor drives the warhead into the hole blasted by the shape charge. At optimum depth, the delay-type blasting cap detonates the warhead to form a crater.

The utilization of the M180 Demolition Cratering Kit is a marked departure from the laborious, time consuming and logistically demanding conventional methods of subsurface explosive emplacement used by engineers since World War II.

Development and testing of the M180 Kit began in 1963 at Picatinny Arsenal. Subsequent testing and evaluation was conducted at Fort Knox, Kentucky, Fort Bragg, North Carolina and Yuma Proving Ground, Yuma, Arizona, using a wide range of environmental conditions, soil types and kit configurations. Crews of varing experience and training were used to effectively evaluate the human factors engineering of the kit. The primary goal of the testing was to determine if the M180 Kit could consistently produce an effective crater. Doctrine defines an effective crater as one which denies passage to wheeled vehicles and forces tracked vehicles to make at least three passes while trying to traverse it. In order to meet this criteria, the test requirement further established that one M180 Kit should be able to produce a crater fifteen feet in diameter and seven feet in depth with thirty degree side slopes.



DEMOLITION KIT, CRATERING: XM180

FIGURE — 1

Testing showed that the M180 Kit was most effective when employed in a series of three or five kits.

SAMPLE TEST DATA

Number of Kits	Depth (FT)	Diameter (FT)	Width (FT)	Length (FT)	Soil Type
1	5.0	26.5			Sandy Clay
*1	2.4	20.3			Sand
1	7.7	25.9			Compact Clay
1	7.2	25.0			Compact Clay
3	8.8		36.0	36.0	Sandy Clay
3	6.7		31.0	24.0	Clay
3	10.4		35.0	35.0	Clay
3	8.0		32.6	34.4	Clay
*5	4.0		30.0	26.0	4 ft of gravel over granite
5	5.9		31.7	32.0	Sand
5	13.0		42.0	39.0	Clay
5	11.4		40.6	39.6	Clay

*Failed to meet criteria for an effective crater.

FIGURE — 2

It was found that the size, shape and effectiveness of a crater is directly dependent on the soil conditions. While the M180 Kit can produce craters in all soil types, those attained when the kit was employed in sand or bedrock were not consider effective.

The emplacement time during testing was excellent. The times for two man crews using packaged kits were 3-5 minutes for one kit, 15 minutes for three kits and 25 minutes for five kits. Further testing revealed that on-site times may be significantly reduced if kits are pre-assembled prior to arrival at the target location. In addition, use under blackout conditions had little effect on emplacement; extending the times by only three minutes for the five kit configuration. These rapid emplacement times were achieved by soldiers who had a basic working knowledge of conventional demolitions and a brief familiarization with the kit. No special expertise or training was required.

One shortcoming disclosed by the tests was that the stardard ten cap blasting machine, organic to combat engineer units, was not sufficient to detonate a series of M180 Kits. Fifty cap blasting machines were needed to secure reliable results.

As stated earlier, the test results showed that the M180 Kit was most effective when employed in series against well compacted, cohesive soils. This includes its employment against asphalt and concrete surfaces overlaying these type bases. When employed in a series, all kits are detonated simultaneously. It was found that a diagonal pattern acorss the surface produced the most effective craters. Proper employment of the M180 Kit in standard three and five kit configurations is shown in Figure 2.

The M180 Demolition Cratering Kit's capability of quick emplacement allows for the rapid deployment of craters to enhance offensive, defensive and retrograde operations. Rapid employment of craters is not even considered using current techniques. Although no testing was conducted using the M180 for other missions, evaluators fret that it could easily be employed in a vertical mode against bunkers, tunnels and bridge abutments. The kits use may be limited only by the imagination of the using engineer. Field use and training, beginning this fall, will provide a great deal of information concerning its total capabilities.

The M180 Demolition Cratering Kit does have several significant advantages over the present system:

- It may be rapidly emplaced by two soldiers (3-5 min/kit).
- It is simple to emplace under blackout conditions.
- Little training beyond a basic knowledge of conventional demolitions is required.
- Its simplicity facilitates its use by non-engineer troops.
- No surface preparation is required.
- It requires 40% less explosive than current methods.
- It can be pre-assembled for retrograde and reserve target use.
- M180 craters are just as, or more, effective than those made by other means.
- The M180 crater is a one-step operation.
- All explosives are contained in one kit.

The M180 Kit greatly enhances the engineer's ability to support operations on the modern battlefield. Full advantage should be made of this revolutionary cratering capability to stimulate all phases of the engineer support role.

CPT Willis and CPT Sanford are currently working on Master of Science Degrees at the University of Illinois, Champaign-Urbana. They have both commanded Combat Engineer companies and are recent graduates of the Engineer Officer Advanced Course.

A TIME IN HISTORY

Theron P. Snell

The 978th Engineer Maintenance Company.

Born to fill a need generated by Modern War, the 978th Engineer Maintenance Company was activated on 5 November 1943. From the beginning, the 978th was the product of a military checkers game. The cadre of enlisted men came from the 475th Engineer Maintenance Company in Iceland. One officer was assigned from the 972nd Engineer Maintenance Company, North Carolina, while Captain H. R. Farrell the company commander was assigned from the 567th Engineer Dump Truck Company in Illinois. This skeleton crew came together at Camp McCoy, Wisconsin where five more officers joined them from the Engineer School at Fort Belvoir. Some of the enlisted men needed to complete the TO/E dribbled in from various parts of the country. The roster was completed on 28 January, 1944, when 144 enlisted men dropped in from Camp Haan, California. The resultant company was a strange group of cast-offs, misfits and extra hands. The first formation at McCoy looked like a rainbow as it lined up. Among those in that line were ex-antiaircraft artillerymen, ex-tankers, Pacific combat veterans and even a few who had been at Pearl Harbor on 7 December 1941.

By February, 1944, the company, under a new Captain, Harry H. Ingraham, finally gelled — not necessarily with unit pride — but they gelled. As a lieutenant in the Company wrote in 1945, there was a deep rivalry between line outfit men and engineer-trained men. Those who had seen combat or had had combat training thought combat should be stressed, while the Engineers saw the company mission as being one of highly trained technical support. Many men with line outfit ratings were promoted to technical ratings and then broken when they obviously couldn't play their new roles. The end result of this bickering was an elimination of line non-coms and the failure to achieve, the first time, an overseas fitness rating.

Be that as it may, the 978th did do good work once they had the chance. As a newspaper recorded at the time, the 978th showed its mettle at McCoy when it repaired the post steam-shovel — utilizing the Company's mobile shops and testing its organization. Since, as Captain Ingraham said at the time, the job was similar to the jobs it would face in the combat zone, the 978th learned a lot and settled into a fine working outfit, unified not necessarily by internal harmony but by the job they, as a group, had to do.

The "job they had to do" was the maintenance of Engineer equipment and direct maintenance support of units actively engaged in combat. They did it while attached to the 1104th Engineer (C) Group, XIXth Corps, 9th Army in Europe. The 978th provided this service not only for engineer units but also for Infantry HQs, field artillery units, medical units and others. Adapting itself to the needs of war, the 978th also performed duties ranging from transporting Allied POWs to evacuation centers to providing military government and being the initial occupation forces in towns bypassed by armored spearheads. The 978th proved to be born of modern war and completely adaptable to its needs.

This is not to say that the 978th was a jack-of-all-trades. It wasn't. It was a highly skilled outfit that was able, because of the ability of its personnel, to meet novel situations and to come out ahead. In the process, the Company suffered 5 wounded and earned a Meritorious Service Unit Plaque, as well as numerous commendations, for its actions during the Bulge, plus the Roer and Rhine River Crossings. Its normal mission necessitated the Company's personnel working on their own — allowing the individual ability of the men to best be utilized. Moreover, crews of 3 to 10 men would travel all through Corps areas repairing, checking and servicing equipment. These crews woud be gone for days, thus putting them on their own. These independent missions gave the impression that the company was organized around the job, not its unit designation. In other words, the company, faced with small independent jobs, had to be made up of small and independent units. The cohesion came where it was needed — in the dedication to the job at hand and in the collective skill needed to carry it out.

Finally, it should be pointed out that, while the outfit did not win the war single handed, it did perform a vital role in a modern army. Direct maintenance support of combat elements was needed if the mechanized, motorized army was to carry out its mission of defeating the enemy. The 978th did that well. It was able to convert the potential draw-back of its checker-like origin into an asset as it trekked through Europe and into the Pacific.

BRIDGING

EQUAL OPPORTUNITY PROGRAM

The policy of the Army is to provide equal opportunity and treatment for its soldiers and their dependents. Equal Opportunity (EO) means equal consideration and treatment based upon merit, fitness, and capability.

A policy such as this fosters teamwork and esprit de corps. To further contribute to this policy, the Army has revised its AR 600-21, "Equal Opportunity Program in the Army."

GENERAL

The revised regulation goes beyond focusing on race relations. It targets good relationships among all soldiers, regardless of race, color, sex, religion, age or national origin.

The changes reflect a continuing interest in upgrading the Equal Opportunity Program.

The regulation requires major commanders to become more involved in developing and carrying out their own EO programs.

Besides active Army troops, the regulation also applies to members of the National Guard when called to active federal service. It also applies to members of the Army Reserve when serving on active duty, on active duty for training, or in an inactive duty training status.

The training portion of the Equal Opportunity Program has been broadened to make it more adaptable to local situations and to strengthen relations among all groups.

Commanders must tailor the training to their units' needs and may use their own judgements as to the frequency, length, method, and the topics to be covered.

RESPONSIBILITIES

The chain of command will be the primary channel for communications equal opportunity matters.

The Deputy Chief of Staff for Personnel (DCSPER) at DA level has general staff responsibility for all plans, policies, and actions pertaining to the Army Equal Opportunity Program. The Director of the Office of Equal Opportunity acts as the principal staff assistant and advisor to the DCSPER.

Commanders are responsible for training their units in equal opportunity, just as they are for other subjects. Members in the chain of command. including supervisors, will participate in equal opportunity sessions as instructors and discussion leaders.

Staff EO personnel will not be assigned further duties in other human development areas such as drug and alcohol abuse programs.

The EO staff members will function as those of any other section within the command. Command channels will be used in working with EO staff officers in the next echelon of command.

AFFIRMATIVE ACTIONS

Affirmative Actions are those efforts by the Army directed toward assuring that each soldier i afforded an equal opportunity to advance in his or her military career.

Affirmative Actions include identifying and eliminating all discriminatory practices within th Army. They are the keystones of the Equal Opportunity Program.

The regulation calls for an environment in which each member is offered impartial treatment a all times. Commanders must now develop plans and follow-through to achieve that goal

Equal opportunity is everybody's business. The revised regulation reflects this view. Fo example, new emphasis has been placed on the Equal Opportunity role of all commanders an staff officers and not just on the Equal Opportunity Officer.

More than any other single feature, the revised regulation is designed to continue strengthenin the Equal Opportunity Program.

THE GAP

;PONSOR PROGRAM

Moving around in the Army can be a hassle. Orders to another post means packing and noving out, finding a new place to live, locating new schools, getting shots and digging up the kid's pirth certificates—over and over again.

The Army has a program which can take some of the hassle out of moves. It's known as the ponsor program and it works if a soldier takes advantage of it.

Commanders are required by AR 608-7 to make their soliders aware of the program, yet a urvey two years ago showed that 40 percent of soldiers had never heard of the program; 78 percent of the enlisted soldiers said they had not been encouraged to participate in the program. DA officials stress that the responsibility for getting the message to the troops about the mportance of the sponsor program lies with the commander.

The losing command is expected to issue a copy of DA Form 3922 to each departing soldier vithin seven working days after assignment orders are received. The first part of the form is filled out by everyone. If you elect to have a sponsor from your next unit, simply fill out the second part of the form. A copy of that form is then sent to the gaining unit and the wheels of the sponsor program begin to roll.

The gaining unit has a fixed number of days to accomplish certain things after receiving the orm. First, a sponsor is appointed; the sponsor should be of equal or higher rank, and the same ex, marital status and professional specialty as the person being sponsored. Second, a welcoming etter should be sent by the CO along with a locally produced information packet. The newcomer is nformed about such things as government and civilian housing, schools, household requirements, climate and recommended clothing, along with any other information that might help a soldier and his family adjust to the new location.

The sponsor should send a letter with home address, duty and home telephone numbers. The etter should include the number of the housing referral office as well. The newcomer should be urnished with a map of the area and should be advised that he or she will be met by the sponsor upon arrival at the new post.

There are many bits of information that a sponsor can provide. For example, some countries (and states) do not allow personal weapons or gun collections. Some countries do not allow automobiles made after a certain year into the country; some areas do not have unleaded gas. Restrictions on exotic pets and quarantine lengths can become major problems for a soldier who knows nothing about them. Some overseas posts may not be able to provide certain necessary urnishings. The sponsor can pass along that kind of information.

The sponsor should accompany the newcomer during in-processing at the unit, finance office, amily housing office, the Army Community Services Center, vehicle registration, etc. Along with his, an introduction to coworkers and a tour of the post and local area will do much to make the newcomer feel at home.

Dispelling fears and false impressions the newcomer may have will make transition from one post to another happier and simpler for the soldier. Commanders can make the sponsor program a real "people program," but it can work only if soldiers understand it and use it.

FLIGHTS OF FANCY

How many soldiers imagine visiting exotic places while on leave? Ideas of flying to far-off Spain, England or the Middle East may intrigue the soldier with pay in hand and leave on the books.

There are ways to see the world without blowing three months' pay if the traveler is willing to plan well in advance. Among the ways to travel for less money are Space Available (Space A) on military aircraft, Advanced Booking Charters (ABCs), and Overseas Military Personnel Charters (OMPCs).

Space A travel can help soldiers take their dependents on trips anywhere except in the continental United States. The soldier may catch flights from the US to an overseas destination, or from one overseas destination to another. Space A on military aircraft is free air transportation. The Military Airlift Command (MAC), which handles most flights, does, however, charter commerical flights to meet part of its military requirements. Passengers who fly Space A on MAC charters must pay a $3 federal tax and a $2 surcharge.

All Space A travel works the same, though, and here are the basics:

- the soldier must appear at the MAC terminal Space A counter in Class A uniform, and must present a valid ID, an up-to-date shot record (International health Record), a DA Form 31 showing authorized leave and, when required, a passport
- dependents must be accompanied by sponsors, must show IDs, and must present shot records and passports
- each traveler is authorized 66 pounds of luggage
- soldiers may request up to five destinations when they sign in on the MAC Form 53 for Space A transportation; space on a flight is never guaranteed, but a traveler may elect to accept a flight going to a destination that can be used as a jumping off point to another

PATIENCE PAYS

After seats needed for official military business are filled, Space A passengers grouped into four categories are seated in those remaining. Seats are given out within the categories on a first-in, first-out basis—date and time of sign-in are important. Here in general terms are the four categories:

- Cat One: dependents of military members, civilians and their dependents on emergency leave (active members on emergency leave go Space Required)
- Cat Two: accompained or unaccompanied military memebers on ordinary leave
- Cat Three: dependent students
- Cat Four: retired military personnel and their dependents

Space A calls are made 1½ hours before a flight, and anyone who does not answer is dropped from the list. It pays to stay close and listen because there may be last minute openings making available seats not open during the first call.

There are disadvantages. Travelers are sometimes caught in MAC terminals for days when space on flights to selected destinations is unavailable. Sometimes passengers actually get seats and then are bumped in favor of persons or things with a higher priority. Travelers may end up taking commercial flights at unexpected expense and should carry sufficient funds to cover the trip back to their respective duty stations. Bear in mind that a soldier traveling alone is far more likely to catch a military hop than a soldier traveling with dependents.

COMMERCIAL CHARTERS

Traveling on commercial charter flights has fewer built-in problems than Space A. Charters are not free, but neither will a soldier spend time in terminals using up leave that could be spent at the destination.

Use of Advanced Booking Charters and Overseas Military Personnel Charters Requires planning; and the savings in time and money are usually worth the effort. Applications must be made a month of two in advance of the scheduled trip. Flights are economical, saving about 30 percent over fares on regular commercial flights, and the soldier's money is protected because each charter must be accepted by the US Civil Aeronautics Board. Send applications early—after application deadline seats usually are not available.

OMPCs are scheduled specifically for military members and their immediate families stationed overseas and may be purchased as one-way fares. ABCs must be booked for the round trip and are available to CONUS-based soldiers and their families.

Soldiers may fly on charters to and from specific destinations and try to get Space A flights o other places during the leave period. For instance, a charter to Germany would save time. Once in Germany, soldiers could sign up for Space A seats to make interesting side trips. Flights from the MAC terminal at Ramstein, Germany, go to Spain, Greece, England, North and East Africa, Italy, Scandinavia, and the Middle East. It is still important to remember that Space A seats are usually very limited in number.

Whatever the decision, ABCs, OMPCs or Space A all the way, soliders and their families can, with patience and planning, make dream vacations realities.

GETTING AWAY FROM IT ALL

There are many ways that a soldier can be absent from his job, most of them legal.

The most common form of absence is ordinary leave. Every soldier is authorized 30 days of eave a year, accrued at the rate of two-and-a-half days a calendar month.

DA policy encourages soldiers to take leave just about anytime they wish unless to do so would nterfere with the unit mission. Soldiers may even request leave in conjunction with Temporary Duty (TDY) but must insure that military transportation is used only for the TDY portions of their ravel.

- Advance leave. If a soldier uses all of his or her accumulated leave and needs more time to ake care of an emergency or personal problem, the commander may authorize up to 45 days advance leave. This leave will be taken from possible future accumulated leave.
- Excess leave. If a soldier faced with an emergency doesn't have enough ordinary and advance leave, the commander can authorize excess leave until the emergency is taken care of. The maximum combined leave that the soldier is allowed is 60 days (ordinary + advance + xcess). Soldiers will receive no pay and allowances while on excess leave. Of course, excess eave will not be deducted from accumulated leave balances.
- Convalescent leave. Commanders may authorize convalescent leave to soldiers under medical care not fit to return to duty. Convalescent leave is not chargeable to accumulated leave.
- Environmental and Morale leave. Soldiers stationed in areas of extreme hardship overseas may be authorized environmental and morale leave. This is deducted from accumulated balances s ordinary leave.
- Rest and Recuperation leave (R&R). R&R is authorized from hostile fire areas where rdinary leave is not possible. R&R is charged against balances as ordinary leave.

Passes are not counted as leave and may be authorized for up to 96 hours. A regular pass is ot issued for more than 72 hours (3 days). A 96-hours pass may be granted by commanders on pecial occasions or in special circumstances such as:

- compensation for extra work ("comp-time").
- compensation for long or difficult deployment from home station.
- compensation for duty in an isolated location where normal passes are inadequate.
- Special recognition for exceptional performance, such as Soldier of the Month, Year, etc.

A pass may not be combined with a holiday period, nor may a 96-hour pass be combined with a egular pass or holiday period when the length of the time off exceeds 72 hours.

Other types of authorized absences include:

- "Administrative Absence" which may include permissive TDY and is not chargeable as eave. Some of the cases where Admin leave may be granted include: attendance at meetings which deal with military duties; attendance as a member of the Board of Directors of a DoD credit nion; participation in competitive sports events; attendance in response to a subpoena, summons, r jury duty; and participation in other official or semi-official programs of the military where DY or TAD is not appropriate. These programs must enhance the soldier's value to the military r increase the soldier's understanding of the service.
- "Proceed time" is not chargeable as leave and is authorized for the preparation of PCS rders for soldiers entitled to transportation of dependents or shipment of household goods.

Leave and pass are one of the many benefits that the soldier is entitled to. In all cases it is the ommander who determines what type of absence the soldier is authorized. There are very few ivilian firms that allow employees 30 days vacation a year, and the soldier should take care not to buse the leave and pass system.

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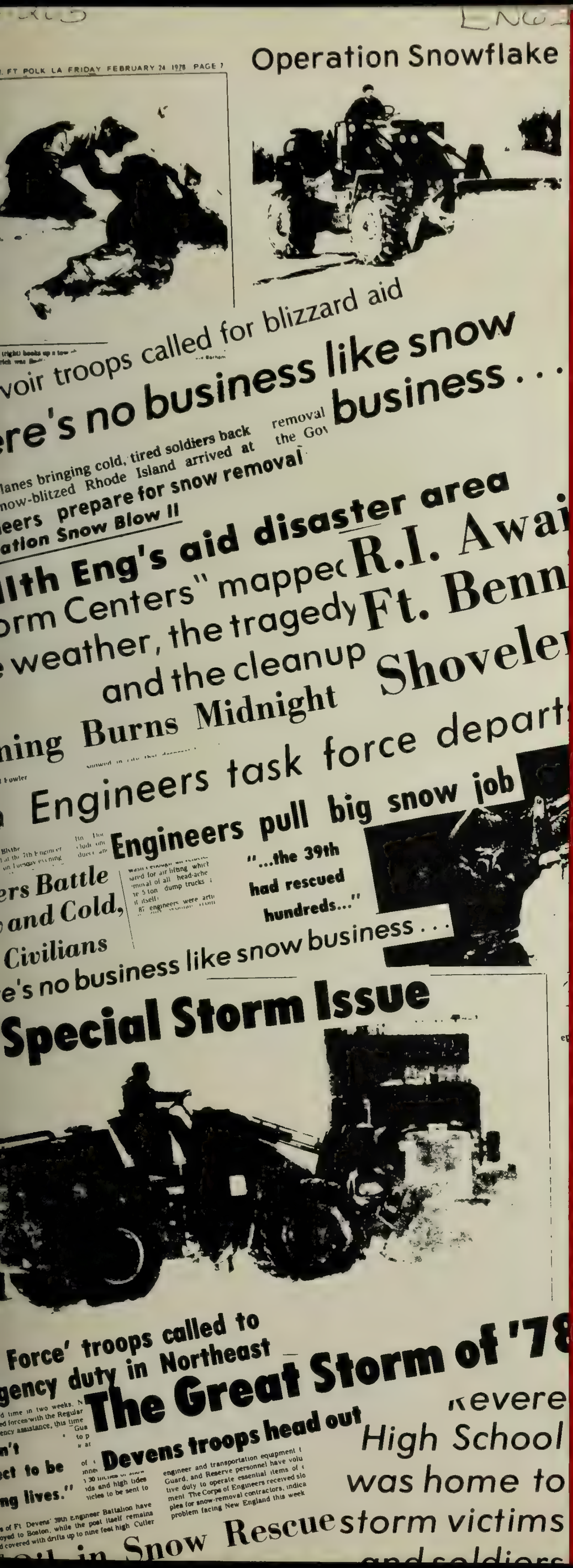
FT POLK LA FRIDAY FEBRUARY 24 1978 PAGE 7

Operation Snowflake

voir troops called for blizzard aid

ere's no business like snow business . . .

lanes bringing cold, tired soldiers back
now-blitzed Rhode Island arrived at

removal
the Gov

eers prepare for snow removal
ation Snow Blow II

lth Eng's aid disaster area

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weather, the tragedy
and the cleanup

R.I. Awai
Ft. Benn
Shoveler

ning Burns Midnight

Engineers task force depart

Engineers pull big snow job

ers Battle
and Cold,
Civilians

"...the 39th
had rescued
hundreds..."

e's no business like snow business . . .

Special Storm Issue

Force' troops called to
gency duty in Northeast

The Great Storm of '78

Devens troops head out

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ng lives."

in Snow Rescue

Revere
High School
was home to
storm victims
and soldiers

THE ENGINEER

SPRING
1978

**Army engineers anchor Operation Snow Blow II
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USAES

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The 1978 Corps of Engineer Officers and Warrant Officers Directory will be available for purchase on May 1, 1978. The Directories may be ordered from the Public Affairs Office, United States Army Engineer Center and Fort Belvoir, Fort Belvoir, Virginia 22060. Orders must include a check or money order for $2.25 per copy, made payable to the Periodical Publication Fund. Please allow three to four weeks for delivery through the mail.

From the Editor

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As your new editor, I take this opportunity to say a few words about myself, about THE ENGINEER, and about you who belong to the US Army Engineer family.

I am a professional journalist with eight years of experience in newspapers and public information, but this is the first chance I've had to work with a periodical. So, don't be surprised if the next three or four issues of THE ENGINEER reflect that combination of experience-inexperience. I set high standards for myself and I fully expect to meet those standards—in time. I'll need your cooperation and assistance, but I'm told that members of the Army Engineer Corps stand ready and willing to lend a hand. That's a big plus right off the bat. As you know, teamwork, effort, and leadership is a tried and true formula for getting the job done.

Apparently, THE ENGINEER has experienced somewhat of a stormy life, marked by numerous changes in editorial and administrative personnel and policies. But let's forget the past and look to the future. Changes in content, format and design are needed to keep abreast of changing times. I assure you such changes will be carefully planned and executed over a period of several issues. There won't be any radical changes overnight.

Finally, the lifeblood of any publication is its readership. Obviously, without readers, a newspaper, magazine, or newsletter has no reason to exist. So I want to hear from you. I want to know what you like and dislike, what you think of this issue of THE ENGINEER, what you would like to see in future issues. If you believe you have a good idea for a feature article, give me a call or drop me a note with a brief outline of the idea. You'll notice that this issue has no "Letters to the Editor," a regular department of most periodicals which is virtually essential to good, two-way communication. And, after all, communication is the sole purpose of THE ENGINEER. So if you have something to say, let's hear it. You'll not only be doing me a favor, but yourself as well.

Jerome J. Hill

Training notes

Engineer Training Materials

This will be a banner year for the production and distribution of Engineer training materials, including Soldier's Manuals, Commander's Manuals, Skill Qualification Tests (SQTs), and Army Training and Evaluation Programs (ARTEPs).

The first of 67 Engineer Soldier's Manuals, developed by the US Army Engineer School, was distributed to the field in April, with subsequent distribution scheduled through March, 1979. (See Chart 1)

The Soldier's Manual will provide guidance for the administration and evaluation of training for each MOS. Manuals provide a uniform training base for each MOS so that soldiers receive the same instruction for each skill level, whether the instruction is institutional (such as Advanced Individual Training) or unit-conducted (such as extension/on-the-job) training.

The Engineer Soldier's Manual is designed to inform the soldier which tasks must be performed to meet MOS qualification. Once the soldier masters each task and becomes more proficient, he may progress to positions of greater responsibility and qualify for promotion to the next higher rank.

The first of 32 Commander's Manuals will be distributed to the field during the third and fourth quarters of Fiscal Year 1978. Commander's Manuals are designed to provide commanders, senior noncommissioned officers, and/or trainers with adequate information to plan, conduct, and evaluate individual training for each MOS. The Commander's Manual contains a listing of all critical tasks the soldier at each skill level must be able to perform. It describes the life cycle training plan for an MOS and establishes the location and method used for training in each task. Commander's Manuals will be published for each MOS, except those applicable to grades E-8 and E-9.

Skill Qualification Tests for Engineer personnel will begin in January 1979 with Career Management Field 12, Combat Engineering (less MOS 12F), and end with MOS 35E of Career Management Field 29, Electronics Maintenance. The SQT for each CMF will be administered over a six-month period. (See Chart 2)

Unlike the old MOS test, the SQT will include hands-on training modules (up to 40 percent of the test). In order to achieve MOS qualification, soldiers must study the reference materials in the Soldier's Manual, and adequately perform tasks as outlined in the SQT notice.

The Army Training Evaluation Program (ARTEP) establishes minimum training objectives keyed to acceptable degrees of proficiency and levels of performance, and provides flexible guidance for attaining those objectives. If weaknesses in certain areas are noted during an evaluation, the commander may require additional training in those areas until the unit is proficient.

The ARTEP has significantly helped commanders in training their units. Currently, there are 11 published programs, but additional ARTEPs are scheduled for distribution to the field shortly.

To summarize, published training materials should have a great impact on the individual soldier and unit this year. If used properly, they should improve the quality and proficiency of the Engineer soldier in today's Volunteer Army.

CHART 1

Soldier's Manual
Distribution Schedule

Time Frame	MOS
Third & Fourth Quarters Fiscal Year 1978	12B, 12C, 12E, 62B
Second Quarter FY 79	35E, 51B, 51C, 51G, 51N, 51M, 51R, 51T, 52C, 52D, 62E, 62F, 62J, 62N, 81B, 82B, 00B
Third Quarter FY 79	41B, 41K, 81C, 82D, 83E, 83F

CHART 2

SQT Test Periods

Career Management Field	Test Period
CMF 12	1 Jan 79–30 June 79
CMF 51	1 July 79–31 Dec 79
CMF 81	1 Oct 79–31 Mar 80
CMF 63	1 Jan 79–30 June 79
CMF 29	1 Jan 80–30 June 80

Tips to the Trainer

Installing the standard pattern minefield or any type of conventional minefield is a labor intensive and time consuming exercise, usually done during field training exercises. However, units can easily maintain proficiency in siting, calculating, and recording all types of minefields without consuming unnecessary time and do it just about anywhere during normal training periods by using the "Mini Mine Kit."

The kit includes a simple box or other container with the following contents: small mines fabricated from old or excess broom or mop handles; a compass to record and shoot azimuth directions; a tape measure to scale distances; minefield recording forms; a ball of string to lay out centerlines and lanes; and FM 5-34, Engineer Field Data.

The number of mines included in the kit will vary depending on how large you want your minefield. A recommended number would be about 600 pieces (slices) which are painted according to function: 400 blue mines for AP fragmentation (M-16A1), 100 green mines for AT plastic (M-19), and 100 unpainted for AT metallic (M-15).

You can increase the variety of your collection by cutting more pieces and painting them different colors. For example, you might paint some red for AT tilt rod (M-21), and others yellow for AP blast (M-14).

Once the kit is assembled, it may be used to develop both individual and collective mine warfare skills from the individual squad member to the highest member of the command who participates. The kit allows all to see the Giants Eye View, at a scale of two inches equals one meter/pace.

To demonstrate the versatility of the Mini Mine Kit, suppose you want to train a squad of engineers in the company dayroom. No problem. Just site your minefield between the pool table and the ping pong table—a likely OPFOR avenue of approach. The distance between the pool table and the ping pong table is about 20 feet when converted to scale of two inches equals one meter/pace equals 132 meters. Depending on density, you're ready to calculate from FM 5-34. After your calculations are complete, lay out and record the minefield, using the compass, tape measure, and string.

It is realized that specific hands-on skills such as arming and anti-handling device installation will not be exercised in the dayroom example above. However, such a simulation technique will undoubtedly educate all members of squads and platoons and when the real task is accomplished later in the field, the "Giants View" provided will make all members more knowledgeable.

(Editor's Note: The mini mine kit training idea originated with the 13th Engineer Battalion, Fort Ord, California. If your unit has developed innovative training techniques, please let us hear from you so that we can share them with others in the field. Forward your suggestions to Commandant, US Army Engineer School, ATTN: ATSE-TDC, Fort Belvoir, Virginia 22060.)

Sergeant Bruce Baker prepares to fire a Surface Launched Fuel Air Explosive Mine Neutralizer (SLUFAE) during testing at the Cold Regions Test Center in Alaska last winter. The tests were conducted to determine how well the SLUFAE functions under the stress of the cold regions.

Pamphlets to Circulars

The Engineer School has decided to convert Task Training Pamphlets (TTPs) to Training Circulars (TCs). There will be no difference in appearance or contents following the conversion, but distribution and identifying numbers will change.

Since TCs are DA publications, they will be distributed through the pin point distribution system. If your unit does not receive enough copies, submit a DA Form 17 as you would for any other Army publication.

Special attention should be given the TC number now that the TTP program is being converted. The first digit in an engineer Training Circular is always 5. The second and third numbers indicate specific ARTEP tasks. For example, TC #5-6-17 is engineer task 6-17, Cratering a Road.

Program Update

The USAES has recently updated a program previously distributed by TRADOC. The program is listed as -7B-051-0183-B, Training Management: Engineer Case Study (Jan 78), with a running time of 17:20. For a direct replacement of the earlier version, send your cassette copy to the USAES, ATTN: ATSE-TDS (ETV). If you have not seen this program, you can obtain a copy through your TASC.

George Washington, Engineer

by David M. Cleary

George Washington, born 246 years ago, has long been called "first in war, first in peace," as well as "first in the hearts of his countrymen."

But few Americans realize how closely the wartime and peacetime roles of "The Father of His Country" were related—and the profound influence he had toward industrial and technological development of a fledgling nation in an uncharted wilderness.

Yet, thanks in large part to Washington's leadership, the United States grew into an industrial giant which:

—Wrested world trade leadership from England, although the British homeland had many years head start in the Industrial Revolution.

—Has created a standard of living which is the envy of the world.

—Became the "Arsenal of Democracy" in World War I, and supplied armaments to such allies as Russia and China in World War II.

Though often described as a "surveyor," George Washington was one of the New World's earliest engineers. Certainly he was the first influential American to alert his countrymen to the need for technological development.

Largely because Washington repeatedly recommended the training of engineers, the United States now boasts roads, factories, pipelines that carry oil across the nation, and a host of technological industries in chemical, electronic and many other fields. It is engineers who apply scientific knowledge to useful purposes.

Shortly after he was named Commander-in-Chief on June 15, 1775, Washington warned the Continental Congress that success in a war against England would depend on good engineering: knowing how to build forts, and how to storm those held by the British, and—most important of all—moving troops across countryside that had few roads, against British forces which controlled waterways on which soldiers could be moved by ships, small boats and barges.

Such a war could be won, Washington said, only through extraordinary feats of engineering.

The newly-appointed General spoke from experience. Twenty-one years earlier, at age 22, he had built a fort in Western Pennsylvania—then part of Virginia—as an officer of the Virginia militia engaged in the French and Indian War. And he had applied sound engineering principles in managing his family estate at Mount Vernon, which had become one of the most successful farming enterprises of the New World.

Washington's appointment came a full year before the "Thirteen Colonies" declared themselves independent of England. But fighting had already broken out at Lexington and Concord, and the Continental Congress had been hastily formed to deal with that crisis and the impending war.

Unfortunately, the Continental Congress had neither the inclination nor the wherewithal to provide engineers to General Washington. Washington's army suffered humiliating defeats—at Trenton, Princeton, Philadelphia and elsewhere—and were forced to take refuge, during the grim winter of 1777–78, at Valley Forge.

History tells how close we came to losing the Revolutionary War that winter. Washington's troops were often "barefoot and otherwise naked." Deserters often outnumbered new recruits in a given week.

It was in the late Spring of 1778, just ten days before leaving Valley Forge to engage the British in what later became known as the Battle of Monmouth, N.J., that Washington decided to educate engineers among the officers already serving with his pitifully small forces.

On June 9, 1778, he issued the General Order now recognized as the first proposal by any American to establish a school of engineering on the North American continent.

It would be nice to report that the "Corps of Engineers" formed in 1778 helped win the War of Independence. Americans hazy on their history may even imagine that Ethan Allen of Vermont was among the first of Washington's students, and learned how to capture Fort Ticonderoga.

Nothing of that kind happened.

Fort Ticonderoga at the northern end of Lake Champlain, had been built by the British to prevent the French, who held most of Canada, from invading via the lake and the Kennebec and Hudson rivers to reach New York.

And it was on May 10, 1775—the same day the First Continental Congress convened—that Ethan Allen and some men obtained the surrender of Ticonderoga from a British commander who had no orders from his homeland identifying the colonists as enemies to be resisted.

History also indicates that Washington's own most impressive feats of military engineering during the Revolution preceded his desire to form a Corps of Engineers.

While the colonists still held Ticonderoga (before the British recaptured it) Washington gave Benedict Arnold a force of 1,100 men and instructions to go north from Ticonderoga and capture Quebec. Although that mission was not accomplished, Army units moved artillery pieces from Ticonderoga to Boston, where the British had neglected to occupy Dorchester Heights, overlooking the city and its harbor from the south.

Moving those guns across rugged terrain was a major task, since Washington's Army had no power other than men and horses, and not enough food for either.

Only because the ground was frozen solid, early in 1776, were the men and horses able to move those heavy guns to Boston. The British General, Sir William Howe, had 20 veteran regiments in Boston at that time, and had he placed some of them westward along the Charles River, could have captured the guns enroute.

But nobody expected movement of such heavy items in such cold weather, any more than anyone had expected Hannibal to use elephants to cross the Alps many years earlier, and Washington was able to emplace those guns from Ticonderoga on Dorchester Heights.

The British naval commander, seeing his ships in Boston harbor threatened by those guns, demanded that Howe attack the position. But bad weather disrupted Howe's attack, and the British fled Boston on St. Patrick's Day of 1776, leaving behind 200 cannon and huge stores of small arms, munitions and foods which Washington's forces badly needed.

Other major engineering feats of the War of Independence occurred long before Washington's order of June, 1778. From then on, there were few surprise attacks, and the most successful of Washington's tactics were based on his observation that the British Redcoats moved clumsily when separated from waterways that carried supporting naval units.

So Washington repeatedly enticed British army units away from water, and the famed "minutemen"—called from their farms and other civilian pursuits on short notice—picked off the easily identified "Redcoats" one at a time.

It was through those tactics that the colonists convinced France that their cause was not futile, and in the Spring of 1778 France declared war on England, as an ally of the American settlers.

Not until June of 1788 was the U.S. Constitution ratified by the required nine states, and even then New York and Virginia were holdouts of such importance that the national government was not established until 1789—six years after the peace treaty—with Washington as its first president.

Meanwhile, the colonial "army" had virtually ceased to exist, and so had Washington's ability to set up a Corps of Engineers, and a school of engineering, within that army.

(Continued on page 28)

FAMECE

The Family
Constructi

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by CPT Frank J. B. Moore
and 1LT Donald D. Cantwell

Modern warfare has transformed the battlefield into a complex, fast moving and increasingly lethal area of operation. New weapons systems have extended ranges and as a rule, can hit and destroy any visible target. This is particularly true if the target is stationary or fully exposed. Future conflicts may see US and Allied Forces engaging a large, sophisticated, and highly mechanized enemy in a short-term, high-intensity war. In order to win the first battle, outnumbered in both manpower and equipment, US Forces must be able to move and to fight from protected positions. Combat engineers provide the means to do this.

The objective of winning the first battle places renewed emphasis on the combat engineer. In both the covering force and main battle area, engineers will have to move and fight directly with maneuver elements. In response to the engineers' increased role and required contributions in the forward battle area, the requirements of mission capability for engineer equipment have changed. No longer can there be a great difference between engineer equipment and that of the forward maneuver forces in their ability to move and to survive.

This recognition has led to the Army's development of the Universal Engineer Tractor (UET) and the Family of Military Engineer Construction Equipment (FAMECE). These two new systems, in combination with present military equipment, meet the requirements for engineer effort wherever it is called for—in front, within, and to the rear of the main battle area.

The four major missions of combat engineers include mobility, countermobility, survivability and general engineering. Engineer equipment must be able to accommodate these missions wherever required.

Mobility is defined as the reduction or elimination of natural or manmade obstacles to enhance the mobility of US Forces. Common tasks include reduction of obstacles, construction and maintenance of combat trails, assault fording or bridging of streams and rivers, and clearing of rubble in built-up areas.

Countermobility is defined as reinforcement of the terrain to delay, disrupt, canalize, or kill the enemy. One of the key objectives is to increase the time for target acquisition and engagement, thereby enhancing the effectiveness of our weapons. Mobile enemy forces will bypass kill zones or pass through them too rapidly unless the engineers can canalize and slow advancing formations with well-placed obstacles.

Survivability means providing friendly forces with protected positions. Engineers are employed to dig-in and often to cover positions and reduce the effectiveness of enemy weapons. This includes development of earth berms, dug-in defilade positions, overhead protection and counter surveillance measures. A tank in hull defilade has a 50 percent less chance of being killed by a Russian Sagger missile than if fully exposed. Given the high density of Warsaw Pact artillery, unprotected forces may well suffer defeat before the close-in battle is ever joined.

General engineering encompasses engineer efforts which do not directly contribute to the mobility, countermobility, and survivability of committed maneuver units, but which are essential for their firepower and logistics support.

Presently, all engineer units found in the Corps area have equipment with similar mission capabilities. Divisional, Corps Combat, and Combat Heavy units are all equipped with what is essentially commercial construction equipment with minor modifications. This situation

ary Engineer ment

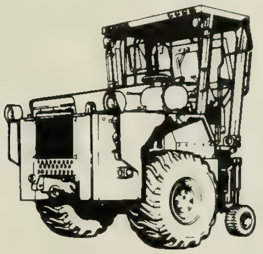
is not compatible with Army requirements which clearly define different needs—for differing missions—at different areas on the battlefield. The UET and FAMECE will provide a solution to this dichotomy for they recognize the dissimilarities of equipment needs for Divisional, Corps and Combat Heavy engineer units.

The requirement for especial military engineer equipment is based on the unique engineering needs in the forward and division rear areas. Engineers employed in the Corps rear area will have construction type tasks, many of which are large size projects, such as airfields. Thus, efficiency on the job site is the most important equipment requirement for rear areas. Combat heavy units normally will accomplish engineer work in the Corps rear area, and can effectively use the current military adapted commercial construction equipment.

Logistic support is another factor that must be considered with engineers employed in the forward battle area. Current engineer equipment suffers from a wide diversity of makes and models which translates to low densities and often results in long "down-time" waiting for repair parts. The problem is compounded by recovery and availability limitations in the combat zone. Historically, the logistics system has not been able to adequately support the diversity of engineer equipment in the forward battle areas. In a short term high intensity conflict, support and availability of engineer equipment becomes critical.

FAMECE will meet the unique requirements for engineer equipment in divisional and corps combat units. It is an earthmoving equipment system that will support the engineer role in a combat environment. The family concept results from the use of a standard power section in order to doze, scrape, load, carry, place and compact earth in support of combat operations.

The FAMECE sectionalization feature enhances mobility by increasing the options for moving equipment. Each section can be airlifted as an external load by the medium lift helicopter (section weight is 15,000 pounds or less) and functional (coupled) vehicles can be air transported, low altitude parachute extraction system (LAPES) delivered, air-dropped or self-propelled at road speeds up to 30 mph. Each section has been developed to maximize use of common family components and parts.

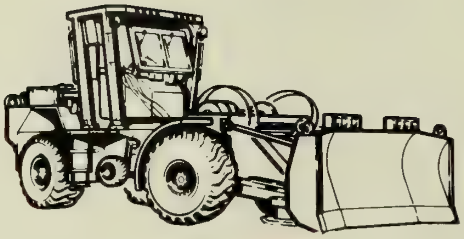


POWER

The heart of the FAMECE system is the power section which is common to all eight vehicles. It includes a Cummins diesel engine, a Clark four-speed transmission, main hydraulic components, 180 degree rotating operator's station, and an articulated steering mechanism. The power section is capable of independent movement for short distances over typical terrain for coupling to a work section. This is accomplished by two small dolly wheels located at the coupling end of the power section. The hydraulically operated wheels are retracted during vehicle (coupled) operations.

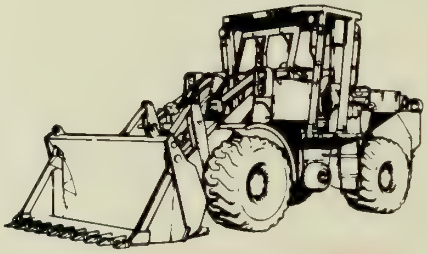
Power and work sections are joined or separated through the use of a simple, functional coupler system. This coupler consists of a male and female housing. Coupling is accomplished when a lock ring is hydraulically activated. The mating surfaces of both the power and work sections are impregnated with a permanent, dry Teflon-type lubricant to avoid attracting dirt to the coupler. The coupling assembly also includes quick disconnect hydraulic, air and electrical lines.

Coupling assemblies are grouped so that lines have only one connection for each type. The power section can be connected to any work section in less than 30 minutes. The entire operator's station on the power section can be rotated 180 degrees in order to place the operator in the appropriate push/pull position for a particular work mode to be employed. Control mechanisms peculiar to a particular FAMECE vehicle (grader controls, for instance) are connected to the power section by an umbilical line when in the working mode and stored on the work section when the vehicle is sectionalized.



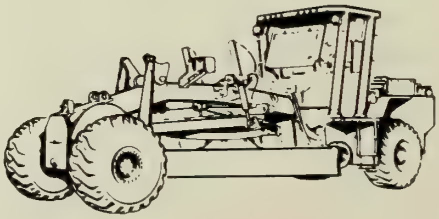
DOZER

The Dozer section is fitted with a semi-U blade, adjustable for both tilt and pitch. It has a dozing capability comparable to the present light DBP crawler tractor and is not intended as a replacement for the medium DBP crawler tractor. In the dozer mode, the vehicle has four-wheel drive and can exert a drawbar pull of 20,000 lbs at 1.5 mph. A hydraulic winch with 35,000 pounds line pull capability is fitted on the dozer. Ground pressure of the dozer is 40 psi to enhance soft-soil mobility.



BUCKET LOADER

The Loader section is fitted with a heavy-duty, multi-segmented 2½-cubic-yard bucket with replaceable teeth and edges. With all-wheel drive, the loader can perform in a clam shell mode for loading odd-shaped objects, or as a dozer. The loader can load 250 LCY/hr when working from a stockpile of sandy-clay soil, and has a lifting capability of 7,500 pounds. The loader also has a drawbar pull of 20,000 pounds and a ground pressure of 40 psi.



GRADER

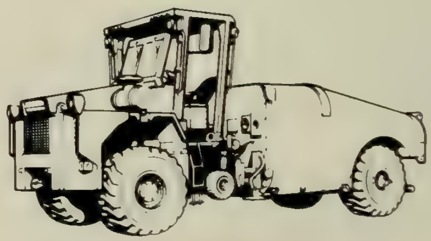
The Grader is an adaptation of the Austin-Western commercial design. It features mechanical drive and Ackerman steering for the front wheels. The grader is equipped with a side shifting 13-foot blade capable of assuming any position required for ditching or bank cutting. It has a 20,000-pound blade pull, mounts a scarifier and is capable of grading in reverse.

SCRAPER

In the Scraper mode, the work section is of the positive-ejector type with a bowl capacity of 10 CY struck. The control system provides hydraulic power closing of the apron, power down pressure on the cutting edge, positive ejector-gate control and a fast-drop bowl for pump loading. The scraper can maintain a speed of 20 miles per hour on a 2.5 percent grade with a full load. A hydraulic motor rear-wheel drive feature is utilized to enhance self-loading. The scraper is highly efficient at self-loading and can be effectively loaded without a pusher.

DUMPER

The Dumper vehicle is designed for on and off-road and has a payload capacity of 10 tons. It features all-wheel drive, a 30-foot turning radius and can maintain 20 miles per hour traveling up a 2.5 percent slope while fully loaded and can travel in convoy at speeds of 30 miles per hour. The rear dumping body is designed for top loading of soil and rock. It is capable of dump spreading while moving forward with the tail gate at either a top or bottom hinged position. The dumper bed is configured to permit use for general cargo hauling and for transporting squad personnel with tools and equipment. It can also tow standard military trailers.

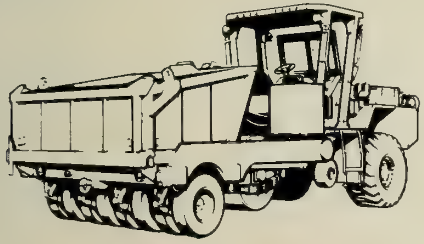


DISTRIBUTOR

The Distributor has a capacity of 2,500 gallons of water and is capable of self-loading in 10 minutes. It can maintain convoy speeds while fully loaded and has an all-wheel drive capability. The Distributor can spray water from the rear in a spray pattern adjustable from 20 to 70 feet in width. The spray heads can be individually controlled from the operator's station.

COMPACTOR (TF)

The FAMECE Compactors are similar in overall design, but are of two separate types. There are two tandem compacting axles on each compactor, with the center axle being hydraulically lifted. The trailing axle has six non-powered, pneumatic tires for either compaction or road travel. The leading axle of one compactor is fitted with a tamping-foot roller which is power driven during operation.



COMPACTOR (SD)

The leading axle of the other compactor section has a smooth cylindrical steel drum with an internally mounted, hydraulically operated eccentric weight vibration mechanism capable of producing 1,500 vibrations per minute and dynamic forces of 25,000 pounds. Each compactor can adjust the axle loads to provide full loads on either side axle or loads proportioned on both compacting axles. Both compactors have a ballast box equipped with an end-dump capability.

FAMECE provides an increase in capability and availability for the combat engineer. Increased capabilities in the family include the 10-ton dump truck, the 2,500 gallon water distributor, self-propelled compactors, and the self-loading scraper. Standardized parts and components, and the ability to replace deadlined or battle damaged individual sections provide increased availability.

The increase in mobility is a great advantage, especially for airmobile and airborne engineer units. All combat engineer units will benefit from the roadability and air delivery capabilities provided by FAMECE. Currently, FAMECE is air transportable in C130, C141 and C5 aircraft and can be airlifted by the Army medium lift helicopter. The ability to convoy to job sites without tractor-trailers will reduce total travel time by eliminating equipment loading and unloading, and transport schedule problems. FAMECE can also use trails not trafficable by tractor-trailers.

One of the greatest benefits will be the reduced logistic requirements. FAMECE eliminates the need for about 30,000 engineer peculiar parts from low density equipment. Many of these parts are designed for equipment with low availability rates. Thus a 6:1 total parts reduction advantage has been achieved. In addition, FAMECE's greater capabilities provide a 30 percent overall gain in work production for the same number of equipment items.

Clark Equipment Company, awarded the development contract in December 1974, has delivered all prototype vehicle configurations for testing. The PQT-G phase of Development Test II is now underway at Fort Belvoir, VA. Operational tests were scheduled to begin this spring at Fort Bragg, North Carolina. A procurement contract award is scheduled in Fiscal Year 79 with an initial operational capability set for Fiscal Year 81.

FAMECE will be issued to divisional, corps, combat, and engineer combat support equipment units. The basis of issue plan has not been finalized, but FAMECE will generally replace wheeled construction equipment in those units. FAMECE will not replace commercial construction equipment (CCE) organic to Combat Heavy Battalions.

FAMECE is one of the new engineer systems that will provide the combined arms team with the combat multiplier needed to win the first battle. Its capabilities are essential if combat engineers are to keep pace with maneuver units and make their full contribution. FAMECE together with other new developments such as the UET, Family of Scatterable Mines (FASCAM) and the Surface Launched Unit, Fuel Air Explosive (SLUFAE), will give combat engineers the means to meet the challenges of the modern battlefield.

Captain Frank J. B. Moore received a BS degree from Washington State University in 1973. He is also a graduate of the Engineer Officer Advanced Course. Captain Moore's previous assignments include the US Army Combat Developments Experimentation Command at Fort Ord, CA. and the US Army Engineer District, Far East, Korea, where he was assigned as a Project Engineer. Captain Moore is currently stationed in Korea.

1LT Donald D. Cantwell is currently assigned to 2nd Engineer Group in Korea. He is a graduate of West Point and the Engineer Advanced Course. He has served in the 197th Infantry Brigade (SEP) and the 43rd Engineer Battalion (Combat Heavy).

The Army Apprenticeship Program

Skills

by Sandra Rittenhouse

Education and training benefits have always been important motivators for recruiting and retaining Army personnel. Emphasis in the past has been on soldiers obtaining academic credit while serving in the military—whether or not the credit happened to be MOS-related.

The Army Apprenticeship Program directly relates MOS skills to civilian crafts or trades. The program provides the soldier with the opportunity to document his MOS skills and have them recognized by civilian trade unions and craft organizations through Department of Labor certification of military training and work experience. The Army Apprenticeship Program serves a dual purpose—it enhances the soldier's civilian employment potential whether he leaves the Army after three years or after 20 years, and it increases the soldier's motivation to improve his performance in MOS skills while he serves in the Army.

The Army Apprenticeship Program (AAP) is not new. The concept for gaining recognition of Army training and skills by civilian craft organizations was first conceived by the Engineer School in the early 1970s as a method of recruiting personnel into an all-volunteer Army. Discussions with the Bureau of Apprenticeship and Training (BAT), US Department of Labor (DOL), revealed a willingness to support an Army Apprenticeship Program. The Department of Labor looked upon the military as a source to provide badly needed craftsmen for the civilian work force. The Bureau of Apprenticeship and Training provided the Engineer School with samples of established civilian programs that spelled out the key points of all apprenticeship programs. All BAT programs require:

- Completion of a work process schedule containing categories of tasks which must be mastered prior to the achievement of journeyman status.
- Completion of formal instruction related to the trade.
- A record of the individual's progress in the program kept on standardized forms.

ntation equals ecognition

By careful comparison of MOS task lists and military courses of instruction with the civilian training programs, Engineer School personnel developed four Army Apprenticeship Program elements for the operating Engineer trades: Plant Equipment Operator, Grading and Paving Equipment Operator, Universal Equipment Operator, and Heavy Duty Equipment Repairman (Construction Equipment).

The program elements were forwarded to the Bureau of Apprenticeship and Training for coordination with appropriate craft organizations. Subsequently, program elements were approved by BAT, thus insuring recognition of military program participants' experience. In March 1975 the program elements were formally registered with BAT, DOL, and the pilot program was inaugurated for what is now an Army-wide apprenticeship program.

The responsibility of enrolling AAP participants was given to Education Services Officers (ESOs) at local Army Education Centers. A central registry of all new enrollees and for official records of hours accumulated by program participants was established both at The Adjutant General Center (TAGCEN) and BAT, with all education centers reporting enrollments to TAGCEN.

The pilot program was successful. Within three years over 1,000 soldiers enrolled in the program. In November 1976, a new Army regulation, AR 621-41, Army Apprenticeship Programs, was published giving each service school the responsibility of developing and implementing apprenticeship programs.

Service schools responded by developing 44 program elements encompassing 100 MOS by September 1977. The Engineer School presently has 15 program elements (see Chart). Each program element has been approved by BAT and is published in a separate 621 series DA Pamphlet. Each DA Pamphlet lists the MOS which are eligible to participate in that program element, and a work process schedule of related instruction for that particular program element/trade.

Most program elements/trades require 6,000 to 8,000 hours of hands-on performance as specified in the work process schedule with 432 to 562 hours of classroom or correspondence courses as listed in the schedule of related instruction. Credit can be obtained for experience gained prior to registration in a program element. Credit for up to half of the required hours in the work process schedule can be awarded to an individual at the time of program enrollment. In order to receive credit, an individual must have his prior supervisor(s) certify completion of tasks directly correlated with those in the work process schedule. Credit for related instruction can also be granted an individual upon presentation to the ESO of certificates of completion of formal training courses and correspondence courses.

To clarify operational procedures in the current AAP, the responsibilities of the proponent service school, unit commander, supervisor, program participant, and Education Services Officer are outlined below.

The Service School evaluates individual program participant's experience and training gained prior to registration and provides a written verification of credit awarded to the requesting ESO.

The Unit Commander should be familiar with the contents of AR 621-41 and with 621 series DA Pamphlets pertaining to MOS held by personnel in his unit. In conjunction with the installation ESO, he informs personnel in his unit of the program. He periodically checks program participant's progress and the supervisor's verification of program participant's hours completed toward the work schedule.

The Program Participant's Supervisor should be familiar with the contents of AR 621-41 and should gain thorough understanding of work process schedules listed in the 621 series DA Pamphlets pertaining to program participants under his supervision. He determines which tasks performed by program participants can be credited towards requirements listed in the work process schedule. He verifies hours of work acceptably accomplished by program participants by initialing weekly and signing monthly each individual's Apprenticeship Daily Work Experience Record Forms which are provided in a log book issued by the ESO.

The Program Participant enrolls in the appropriate AAP element through the installation ESO. He records hours of work that satisfy work process schedule requirements and related instruction requirements in the log book issued by the ESO. He hand carries verified log book back to the ESO for a periodic (preferably each quarter) progress check. And he enrolls in courses fulfilling the related instruction requirement.

The Education Services Officer promotes the Army Apprenticeship Program locally. He registers applicants and forwards names and personal data to TAGCEN. He requests evaluation from the appropriate service school of individual program participant's experience gained prior to registration in the AAP element. He issues log book forms to program participants for record keeping. And he reports each participant's progress, as documented on log book forms, to TAGCEN.

Skills documentation is the key to Army Apprenticeship Program participation and subsequent civilian employment. Properly maintained, the log book constitutes a record of training and work experience which is required for employment in an apprenticeable trade. The skills documentation system is recognized by trade unions, civilian industry and the Bureau of Apprenticeship and Training in Department of Labor.

Although it is primarily the program participant's responsibility to maintain a record of his/her progress, it is up to the supervisor to insure that documentation is accurate—that the hours claimed are neither inflated nor deflated in comparison to the individual's actual performance of MOS related duties. Since the AAP is still in its infancy, it is particularly important that documentation be precise. The Engineer School has been using a maximum of 1,800 hours per year as a general guideline when evaluating experience gained prior to program registration.

Senior NCOs have expressed the thought that the AAP has come along too late for them to participate. This is not true. Supervisory NCOs can still take advantage of the program by attaining their supervisor's certification of hours of work completed in earlier years. The Education Center, charged with administration of the program, will explain procedures for gathering necessary information to verify prior experience, and the Engineer School will assist by evaluating the documentation submitted.

The rewards of program participation are substantial. If an individual completes an Army Apprenticeship Program element, he receives, in addition to the record of hours he has accumulated in a trade, a certificate of completion from Department of Labor that verifies his journeyman status in the trade.

If a soldier is unable to complete the program during his military service, he still receives a certificate from Department of Labor verifying the amount of hours he has completed toward a trade. The certificate, coupled with documented experience, will help the soldier enter a civilian apprenticeship program at a higher level than if he had not participated in the AAP.

In summary, the Army Apprenticeship Program has made civilian recognition of engineer skills a reality. Participation by eligible personnel should be encouraged.

US ARMY ENGINEER SCHOOL
ARMY APPRENTICESHIP PROGRAMS

PROGRAM ELEMENTS	MOS ELIGIBLE Old MOS	New MOS (EPMS)	PUBLICATION
Plant Equipment Operator	62D 62G/62H	62H 62G	DA Pam 621-76
Grading & Paving Equipment Operator	62E/62H/62J 62K/62L/62M	62E	DA Pam 621-77
Heavy Duty Repairman	62B	62B	DA Pam 621-78
Universal Equipment Operator	62F	62F	DA Pam 621-79
Carpenter	51A/51B/51D	51B	DA Pam 621-84
Plumber/Pipefitter	51A/51K/51N	51N	DA Pam 621-85
Electrician	51A/51R	51R	DA Pam 621-86
Lithographer (Offset Press Operator)	41K 83E/83F	41K 83E/83F	DA Pam 621-112
Drafter (Architectural)	81A/81B	81B	DA Pam 621-113
Refrigeration A/C Repairer-Servicer	51L/51A	52C	DA Pam 621-115
Fire Fighter	51M	51M	DA Pam 621-116
Industrial Electrician Repairer	52E/52J	52E	DA Pam 621-117
Power-House/ Electrician Repairer	52E/52H	52E	DA Pam 621-118
Surveyor (Engr)	81A 82B/82D	81A 82B/82D	Publication Date—June 1978
Rigger	12B/12C/51A 51C/51F/51J 51H	12B/12C 51C/51H	Awaiting final approval

AR 621-41, Army Apprenticeship Programs, Nov 76, is the basic regulation governing all program elements.

Sandra Rittenhouse is an Education Services Specialist in charge of all Army Apprenticeship Program development and implementation for the Engineer School. She currently works for the Fort Belvoir Army Education Center and is assigned temporarily, for program development purposes, to the Operations and Evaluation Branch, Individual Training Analysis and Design Division, Directorate of Training Developments in the Engineer School. Mrs. Rittenhouse has served in education centers for five years. She holds a BS Degree in Secondary Education and an MEd Degree in Guidance and Counseling.

Another year, a different season

Thousands of Army Reservists receive two weeks of active duty training at Fort Leonard Wood, Missouri each summer. This year, however, the commander of a training brigade from upstate New York, decided to try something different—annual training during the winter and spring.

Colonel Dean L. Linscott, commander of the Third Brigade, Engineer Advanced Individual Training, 98th Division, headquartered in Ithaca, New York, broke with tradition for two reasons.

First, he wanted to present his troops with a new set of challenges—mud and cold weather. And second, many of the 98th Division reservists have seasonal occupations which require their full attention throughout the summer months.

"It's difficult for many of our men to get away from their jobs during the summer," says Linscott. "They either have to be excused or defer their tours to a later date with another unit."

One increment of the Third Brigade trained at Leonard Wood in March, another increment received training during April, and another increment was scheduled to undergo annual training in May. Of course, large segments of the 98th Division are still scheduled for annual training at Leonard Wood this summer.

The Third Brigade's manning chart indicates that the plan is working. Excusals have been minimal. Morale is considered better than ever. The change appears to have stimulated more interest in training and working with their Regular Army counterparts of the 2nd Training Brigade at Leonard Wood.

Another indication that the change has been accepted by personnel of the Third Brigade is the "retention posture" reported by the unit's S-1 section. That report states that the retention rate of the Brigade has steadily improved throughout the past year.

Annual training during cold and wet weather months might not work for many Reserve units, but there's no question that it is working for the Third Brigade, 98th Division.

Three bridges at Quang Tri

A study in contrasts

by COL Phillip D. Weinert

Contrasts between old and new ways of building are often made but rarely is there an opportunity to witness the differences in practice. (Such an opportunity presented itself in South Vietnam from February to June 1969 in the northern province of Quang Tri.) While modern technology and equipment have improved both methods and quality of structures, it is good to be reminded of what can be accomplished in the absence of modern technology and equipment. The combat engineer is often faced with a request to make do with the means readily available.

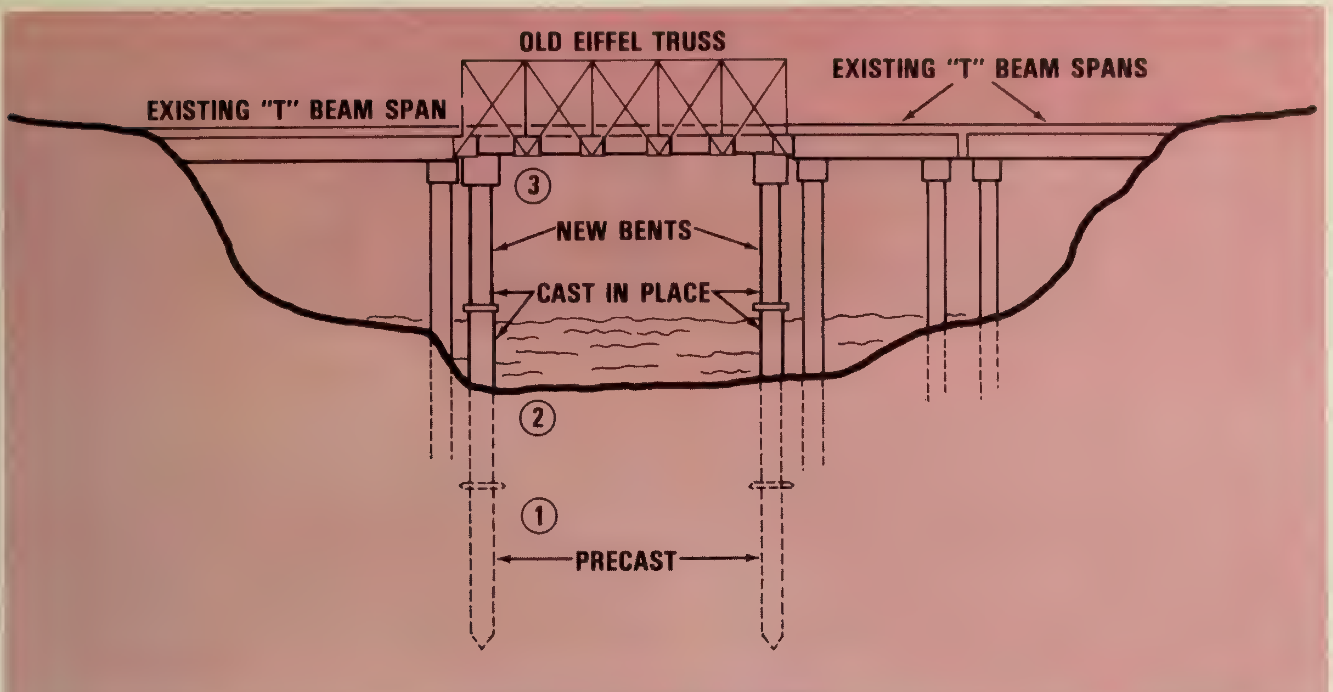
As a result of the Tet offensive in 1968, many of the bridges in the area were destroyed. One bridge in a village just north of the Quang Tri province capital had been replaced by an adjacent class 12 floating bridge as an interim measure. On route 560 leading to the coastal port of Cua Viet through rich farm land, the bridge was an important factor in getting produce to market in the province capital of Quang Tri. Recognition of this gave rise to a project by the public works office in Quang Tri to rebuild the existing reinforced concrete bridge.

At the same time, the US and South Vietnamese military forces in the area embarked on a general upgrading of route 450 from Quang Tri to Cua Viet to provide a more immediate improvement to travel in and out of the area by the local population. This work was part of an overall road construction effort to improve secondary roads throughout the province. A great value of the road was increased stability of the area by improved commerce. This road project included a timber pile bent bridge between the floating bridge and older reinforced concrete structure.

When the US/South Vietnamese military project got underway, the existing floating bridge with wood pontoons and wood deck structure soon proved inadequate to carry the heavy loads of road construction equipment crossing it. The decision was made to replace that floating bridge with one of greater load capacity so that construction could continue uninterrupted. This option was selected because of the immediate requirement to maintain traffic for construction farther north on route 560 while the timber bridge was being constructed.

The old floating bridge was replaced with little difficulty, and as traffic was carried by the new bridge with rubber pontoons and aluminum deck, work was underway by the joint US and Vietnamese Army engineer forces on the pile bent bridge and the public works personnel on the reinforced concrete structure.

At this point, the contrasts were dramatic. Heavy equipment and Vietnamese civilians mingled in crossing on the floating bridge as Army Engineers and public works forces drove piling for the respective bridges. Army forces used conventional pile driving techniques. A diesel hammer was used to drive 14-inch timber piling spliced with steel collars. The public works personnel, working from a timber platform and using a steel derrick arrangement for pile leads, drove precast concrete 30-feet sections by hand. The timber platform rested on timber piling hand-driven into the soft bottom. To drive the concrete piles, a steel hammer was raised using a hand winch and then a ratchet tripped to allow the ham-



CONSTRUCTION SEQUENCE

mer to fall. Through this laborious process, piling was driven nearly flush with the working platform.

At this point, the tops of the concrete piles were prepared for continued driving by exposing the steel. Forms were built in sections and placed around the initial precast section. The sections were so constructed that concrete could be poured by hand on top of the existing piling. A cage of reinforcing steel was placed in the forms and tied to the exposed steel of the first section.

Concrete was mixed on the timber platform by hand using coarse and fine aggregate from nearby alluvial deposits. Mixed in small batches, it was lifted by hand to openings in the forms and placed in a continuous process.

Workers used false work supporting the forms to keep up with the increasing height of the concrete in the piling. When the concrete placement was completed for the pile extension, the forms and false work were removed and the derrick brought back in place to resume driving of the piles. Approximately two 30-foot lengths were driven in this manner. The last section of piling was cast in place leaving the steel exposed at the top for tying in to the cap. Each of the two reconstructed bents was built in this manner. The caps for the concrete bents were cast in place as were the last sections of the bent posts.

After construction of the two bents, an old Eiffel truss about 45 feet in length was snaked out on top of the new bents. The old concrete "T" beam spans were repaired with curbs and railing and the bridge was opened to traffic. The construction sequence is shown in the drawing above. The Eiffel truss was evidently salvaged from the old bridge which had been destroyed and is a type commonly used in South Vietnam.

While the public works personnel completed the concrete work and moved the truss into place, the South Vietnamese and US Army team finished the timber bridge. Piles were joined with 3 × 12 timber bolted for diagonal bracing and caps installed. Stringers were laid and a laminated 3 × 12 decking placed. The bridge was finished with placing of curbs and railings. Once the timber trestle bridge was completed, the combined RVN and US Army team removed the adjacent floating bridge.

Public works construction personnel showed dedication and ingenuity. At the time the timber bridge was completed, reconstruction of the concrete bridge was well underway and completed soon afterward.

Observing the simultaneous construction of the two bridges revealed how much is possible through ingenious use of available materials and equipment, and hard work. Combat engineers, who must often seek alternate solutions due to a lack of desired resources, should be reminded of the three bridges at Quang Tri.

Colonel Phillip D. Weinert, graduate of Texas A&M University, is currently assigned to the US Army Facilities Engineering Support Agency, Fort Belvoir, Virginia. He is a registered Professional Engineer in Washington, D.C., Texas, and California and is an active member of the National Society of Professional Engineers and the Society of American Military Engineers.

Operation Snow Blow II

Crying and shivering, the old lady sloshed through six inches of sea water to answer the persistent knocking at her front door. When she saw the green uniform and combat boots, she clasped her hands above her head and exclaimed, "Thank you God, the Army is here. I'm okay now."

The poignant scene above took place in Revere, Massachusetts, a suburb of Boston that was ravaged by hurricane-force winds, rain, sleet and snow during the first week of February. But it might have been any number of communities throughout New England where the worst winter storm on record wreaked havoc for more than 25 hours.

Houses caved in, cars bobbed helplessly in ice-choked water, snow drifts grew to 10 feet. All movement stopped. At least 30 people were killed during the storm or as a result of it.

But the devastation could have been worse if the military services had not reacted to the call for help with speed and precision.

At the direction of Forces Command (FORSCOM), active engineer units from Forts Devens, Bragg, Belvoir, Benning, Stewart, Hood, and Polk joined forces with National Guard and Reserve units throughout New England to conduct "Operation Snow Blow II," a rescue and snow moving operation of massive proportions.

More than 1,100 active duty Army personnel and 71 Navy Seebees were flown into New England to assist more than 6,000 National Guard personnel and more than 500 Army Reservists activated to combat the catastrophe. More than 1,247 pieces of heavy equipment, including trucks, trailors, ambulances, wreckers, dozers, graders, and scooploaders, were manned around the clock in frantic exhausting efforts to clear snow and abandoned vehicles from highways, airports, and other

Army engineers help New England recover from worst winter storm on record

traffic arteries.

Much of the equipment was flown into the area aboard Air Force C-5-As, C-130s, and C-141s from Hunter, Pope, and Andrews Air Force Bases. In essence, Operation Snow Blow II was an undertaking based on the Total Force concept.

And, although many units encountered problems of one sort or another, the overall operation must be considered a whopping success. More than 375 miles of highway and streets were cleared of snow. More than 5,500 abandoned vehicles were removed from streets. More than 1,370 stranded persons, many of them women and children, were evacuated to safety.

Massachusetts, Connecticut, and Rhode Island were the states hardest hit by the blizzard, necessitating a three-prong attack against the forces of nature. Task Force Alpha, consisting of men and equipment from Forts Devens and Bragg, concentrated on the Boston area. Task Force Bravo, made up of men and equipment from Fort Hood, zeroed in on Hartford; and Fort Belvoir engineers of Task Force Charlie, bulldozed their way into and out of Providence.

The storm struck on Monday, February 6, and by midafternoon of the next day, portions of Massachusetts, Rhode Island, and Connecticut were declared Federal Disaster Areas. Colonel Forest Rittgers, Commander of Fort Devens, was named the Disaster Control Officer.

Based on requests from state officials and members of the Federal Disaster Assistance Administration, Rittgers' primary job was deciding where and when federal troops and equipment would be deployed. It wasn't an easy job.

The 39th Engineer Battalion of Fort Devens was the first unit to respond to the emergency, due to Devens' proximity. Alerted late in the afternoon of February 7, the 39th Battalion's first convoy arrived in Revere around 2 a.m. the next morning, Wednesday. It had taken the convoy six hours of traveling to reach Revere—five hours longer than normal. "We drove our asses off that night," said Private First Class Mike Pyrne of the 39th.

That same day, men and equipment from Fort Bragg, Fort Benning, and elsewhere began arriving in Hartford and later from Fort Belvoir to Providence. Upon their arrival, they found Guardsmen and Reservists already hard at work, evacuating citizens stranded without heat, electricity, food and water.

Ironically, men and equipment from Fort Hood were delayed in their departure for New England because of icy runways, snow and fog.

When Operation Snow Blow II ended, almost a week after it began, order had been restored and a semblance of normalcy had returned. There was still much work to be done, particularly in the coastal communities. But the imminent danger of a few days earlier had been eliminated, thanks to the efforts of thousands of volunteers, National Guardsmen, Reservists, and active duty Army, Navy, and Air Force personnel who proved that the Total Force concept really works.

(EDITOR'S NOTE: Material for this article was compiled from numerous reports and accounts of Operation Snow Blow II. The Engineer appreciates the cooperation of all who provided information that went into the reporting of this story. However, no attempt was made to mention all military units which participated in the operation because the task of documenting such information would have been virtually impossible.)

S AIR FORCE
THANKS from STATE OF CONNECTICUT
To FORT HOOD SNOW DIGGERS OF '78

Games soldiers play

by CPT Denis Gulakowski

Since the end of the Vietnam war, the expense of conducting field training exercises in terms of money and area has risen higher than the price of Coors beer east of the Mississippi. In searching for alternatives that were less draining but as meaningful as the FTX, Army thinkers resurrected an old technique that was generally more popular with hobbyists than military tacticians.

Wargaming dates back to the first sand table caveman used in planning to make off with his neighbor's daughter and has varied in complexity and acceptance as much as the poll results on a campaigning politician.

The Army's approach to exportable systems consists of two types: strictly manual and computer assisted. Manual exercises are designed for maneuver units from platoon through corps and are similar in format to some of the more detailed commercial wargames available at the local hobby shops. The major differences lie in the complexity and sophistication of the training devices. With the exception of the company and platoon level exercises, none of the games can be played by fewer than a dozen individuals and each has provisions to demonstrate the lethality, fluidity, and confusion that will be found on the next battlefield.

Computer assisted exercises are targeted toward the commander and his staff at battalion through corps level and use electronic computers to take over computations and records in support of manually maneuvered combat forces. The same sophistication of fluidity, confusion and lethality of the manual games is found in these with the computer assuming the chores of engagement resolution, indirect fire and air support outcomes as well as numerous other repetitious activities that may otherwise slow down play.

Five manual battle simulations and three computer assisted simulations are presently available. The following are the names of the exercises and a brief description of their operations and components.

Manual Simulations

FIREFIGHT is a platoon level system with a hexagonal grid gameboard, unit designator counters or pieces, and weapons systems effect data. Players move friendly and enemy units across variable terrain, engage in indirect and direct fire encounters and experience the impact of terrain, suppression, and long range weapons lethality on a unit's ability to perform in simulated combat. The game has already been shipped to the field for evaluation, and a production decision is expected later this year. It may be played by two people, requires no controllers and takes one to three hours to play.

DUNN-KEMPF is an exercise which pits a US armor-mechanized infantry team against an OPFOR reinforced battalion through the use of a scaled terrain board and miniature vehicles and equipment. It is a free-play, open-end simulation whereby opposing sides maneuver, engage and conduct operations against each other in an attempt to accomplish the mission. Realism is ensured through the rules which prescribe scale movement, indirect fire and air support activity, direct fire engagement and obstacle impact. DUNN-KEMPF is already in production and is scheduled for distribution to all maneuver battalions in active and reserve status, ROTC regions, and service schools. It may accommodate from eight to twenty players, requires one controller, and takes a minimum of four hours to complete a scenario.

PEGASUS is the battalion and brigade level command post exercise aimed at enabling brigade and battalion commanders and their staffs to train in controlling and coordinating combined arms operations that would occur in a conflict involving battalion, brigade, or regiment size units. It is the lowest level exercise that provides the capability of direct participation by non-maneuver members of the combined arms team such as engineers, artillerymen and communications personnel. The action takes place on control boards which are enlarged mapsheets overprinted with a hexagonal grid and involves movement, observation, direct and indirect fire, obstacles, and engagement resolution. Controllers manipulate unit counters in accordance with operational plans and orders issued by the commanders and

staffs as dictated by the mission. Communication is by tactical radio or wire and staffs can function in separated and removed areas. Opposing sides respond to each other, providing free play, while scenario inputs may be introduced to stimulate execution of Brigade Command Group ARTEP tasks. PEGASUS requires a minimum of four controllers, at least 14 player/controllers, and 8-12 hours of playing time.

FIRST BATTLE is the simulation currently available for use at the division level. It is similar in format and procedure to PEGASUS with a US division opposing an OPFOR Army. Engagement possibilities are related to unit combat power rather than weapons systems but, as with the other exercises, also provide the commander with helicopter and tactical air support and indirect fire support. FIRST BATTLE can be played as a free exercise although a European scenario is provided. It is played with one controller, at least 12 player/controllers, and takes about 12 hours.

WAR EAGLE is the Corps level exercise now being developed and is basically an arrangement of multiple FIRST BATTLE simulations matching a US Corps against OPFOR Armies. The number of controllers and player/controllers is variable while a minimum of 12 hours must be allocated to complete the gameplay. As with PEGASUS and FIRST BATTLE, WAR EAGLE may be set up in garrison or in a field tactical operations center with staffs functioning as they would in a combat situation. Fifty kits are planned for construction, with distribution this summer.

Computer Assisted Simulations

BATTLE (an acronymn for Battalion Analyzer and Tactical Trainer for Local Engagements) is the lowest level computer assisted simulation in use. It is almost identical to DUNN-KEMPF with miniature vehicles being maneuvered on a scale terrain board as a US task force opposes an OPFOR regiment. The computer keeps track of logistics, the chronology of individual engagements, probability determinations, engagement resolutions, indirect fire plans and a history of the entire conflict. Action is visually displayed on a Cathode Ray Tube (CRT) or printed out, thus allowing players a type of instant replay. BATTLE is a limited production item. Only two are available—one at TRADOC Systems Analysis Agency (TRASANA), White Sands, New Mexico, and the other at the Combined Arms Center (CAC), Fort Leavenworth, Kansas. The latter is used as part of the Command Designee Refresher Course to bring brigade and battalion commander designees up to date on the latest tactics and concepts of combined arms operations. CAC has conducted a survey of TRADOC schools and agencies to determine if a need exists for more than the original two systems. BATTLE requires a minimum

Manual Simulations

	No. Players	Level	Playing Time
FIREFIGHT	2	Platoon	1-3 Hrs.
DUNN-KEMPF	8-20	Battalion	4-6 Hrs.
PEGASUS	14	Bn/Bde	8-12 Hrs.
FIRST BATTLE	12	Division	12 Hrs.
WAR EAGLE	Variable	Corps	12 Hrs.

of eight players, four controllers, one computer terminal operator and several hours, although actual time required may vary considerably.

CAMMS (Computer Assisted Map Maneuver System) is the brigade/battalion computer supported simulation available for infantry, armor mechanized infantry and cavalry maneuver units supported by normal combat and combat service support elements. It is similar to BATTLE in that the computerized functions served are the same, but differs to the extent that unit counters of the PEGASUS variety are employed instead of individual vehicles. The probabilities, resolutions, engagements, administration and logistics capabilities are retained as is the instant replay of the conflict. The computer program allows for employment of friendly units from platoon to brigade size and of OPFOR units equal to two motorized rifle divisions and a tank division. The speed of the feedback results of BATTLE is duplicated with CAMMS and reduces the time consuming mechanical processes. CAMMS is available on a worldwide basis via a timeshare program. Terminals located at the exercise site and linked by telephone and satellite communications to the computer mainframe are available at a selected number of Training Aids Services Centers.

Computer Assisted Simulations

	Level
BATTLE	Task Force
CAMMS	Brigade/Battalion
CATTS	Battalion/Staff

CATTS (Combined Arms Tactical Training Simulator) is a sophisticated computer driven battle simulation system intended to train mechanized and light infantry and armor battalion commanders and staffs in combined arms operations in a command post format. The system simulates the actions of combat units, and calculates visibility, ranges and weapons effects while also maintaining an ongoing status of fuel, munitions, materials, equipment and personnel of the two forces. It, too, is a limited production item. There is only one in existence, at the Combined Arms Center.

Engineer Games

Engineer related simulations and games are still in the developmental phase. However, there is engineer play to some extent in all of the TRADOC simulations. PEGASUS, BATTLE, and CAMMS are the lowest level exercises where engineers can participate as engineer staff officers, while all simulations provide the maneuver commander with engineer capabilities of mobility, countermobility and survivability at the level appropriate to the game.

The Engineer School, in addition to developing and improving engineer play for the TRADOC simulations, is also developing a Combat Engineer Game for the company leadership and the Engineer Staff Exercise, a battalion staff assessment and training exercise. The Combat Engineer Game (CEG) is a self-contained board type exercise designed to test the player in basic military knowledge and develop his planning skills required in essential engineering missions. Despite the name, the game is applicable to both combat and combat heavy units and challenges the squad and platoon leader in its execution. The Combat Engineer Game is scheduled for prototype production and, if approved, should be fielded at battalion level late this year.

The Engineer Staff Exercise (ESEX) is in the conceptual phase of development and will provide the commander a means of assessing his staff in terms of performance of critical staff functions. Developers anticipate that it will be a self-contained unit capable of being implemented with organic personnel assets and being played in one working day's time. Research in support of this task is ongoing with the prototype production tentatively scheduled for Fiscal Year 1979.

What It All Means

For engineers, the technique of simulation presently means two things. Participating as members of the combined arms staff advising the maneuver commander of all the benefits he can accrue from engineer effort and assisting him in such planning is the most obvious advantage. A secondary opportunity takes the form of playing the lower echelon exercises as designed for maneuver personnel thus improving tactical knowledge and gaining a better insight to the operations that engineers will support. With training goals now turning to combined arms integration at all levels, individual branches will be unable to isolate themselves from operations with other different units. Rather, the far-sighted commander or trainer will be searching for relatively inexpensive, yet realistic alternatives to field exercises and will be taking action to identify and employ them with his unit. Battle games and simulations is one of those alternatives.

Captain Denis Gulakowski is an Infantry Officer currently serving as the Engagement Simulations Project Officer for USAES. His assignments have included platoon leader, company commander, battalion training officer and post level project officer. While in Vietnam, he served as District Senior Advisor and Province Engineer Advisor. He has a BS degree in Engineering from the US Military Academy and is completing work on an MA in Behavioral Science from Catholic University. He is a graduate of IOBC and IOAC.

Back to basics

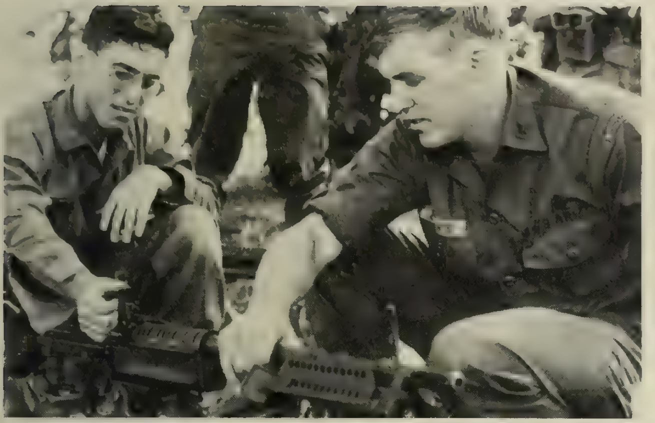
Emphasis on basic Combat Engineer skills in revised Engineer Officer Basic Course

by LTC R. J. Rethlake
and CPT R. Potter

The Engineer Officer Basic Course at Fort Belvoir, Virginia, recently underwent a major revision designed to immerse newly commissioned engineer officers in a training environment where the emphasis is on dynamic, performance-oriented, hands-on training. The foundation for this comprehensive revision stems from the concepts emphasized by General William DePuy, former Commanding General of Training and Doctrine Command.

In an effort to maximize training effectiveness, the Commanding General of the US Army Engineer School established an Ad Hoc committee in January 1977 to review the existing Engineer Officer Basic Course program. The committee's charter was to determine the need for and the extent of course modification and to provide the Commanding General with appropriate recommendations. By late spring of 1977, the committee produced recommendations which led to a complete revision of the course. The new EOBC program was instituted in July 1977 with Class 5-77.

The revised course has a significantly different orientation than the previous version. The dominant thrust of the new course is to place new junior officers into an environment of complete involvement, encompassing tasks that soldiers in combat engineer platoons must be capable of doing. In practice, this means that new lieutenants learn the ARTEP skills of a private, squad leader, and platoon leader, in that order. At each skill level, the student must demonstrate a mastery of the required tasks before advancing to progressively more challenging tasks. The basic skills of a Combat Engineer (12B), with some emphasis on infantry and construction skills, form the core of the program. It is important to note that only those tasks considered critical for a Combat Engineer Platoon Leader have been included in the course. Altogether, the lieutenant must successfully



accomplish 141 unique tasks on a go, no-go basis. Failure to accomplish any task requires the student to restudy and retest the area. The student is allowed three attempts to achieve a "GO." Repeated failure is possible cause for administrative elimination from the course. In addition, leadership ability, attitude and motivation are closely scrutinized throughout the 14 week course.

To complement the new approach, the traditional ranking system of honor graduates and distinguished graduates has been discontinued. In addition, individual involvement in the course has been increased. Student leadership roles have been expanded and student leaders given more responsibility. Students demonstrating a particular expertise participate as assistant instructors for their classmates—an approach which has resulted in greater utility for all students. And each student is required to present peer instruction during the course.

To implement course revision, the Director of Training of the Engineer School created a new division: the EOBC Training Division. It is responsible for all student activities except military justice and administrative functions. Within this new division, a new concept—platoon trainers—is utilized. Each EOBC class is divided into platoons—each platoon is assigned two captains and one senior Non-Commissioned Officer as trainers for the duration of the cycle. They are responsible for presenting approximately 50 percent of the course instruction, monitoring instruction presented by other departments and guiding and counseling the students continuously. It is desirable that at least one of the Captains has successfully commanded a Company, has an Engineering Degree, and has served overseas; preferably in Europe. These trainers serve as the proctors and mentors of approximately 40 EOBC students. A dialogue is established between the students and the trainers which enhances the students' awareness of the standards and conditions in active Army Engineer Platoons and Companies. Engineer Officer Advance Course students function particularly well as platoon trainers because normally they have previous experience in the field.

The EOBC course includes three phases of instruction: general/infantry phase; combat engineering phase; and construction engineering phase. Each phase is designed to interface with the others in such a fashion as to illustrate the interdependence of each and the need for the Engineer Lieutenant to be knowledgeable in all areas. Field training exercises conducted after each phase insure that students can apply the learned tasks in a realistic, fluid, field environment.

The revision of the course has thus far met with great acceptance by both faculty and students. Initial indications from the field and evaluations at the USAES indicate that the performance-oriented environment makes the student more receptive to instruction and significantly more confident in his ability when he graduates.

The final results are not yet in, but if the new approach produces a more confident and positive platoon leader, then the revision of EOBC can be stamped an unqualified success.

LTC Rethlake is the Chief, Engineer Officer Basic Course Division, Directorate of Training at Fort Belvoir, Virginia. He is a Field Artillery officer with a BA from Purdue University, an MA from Central Michigan University, and he is a graduate of the Armed Forces Staff College.

CPT Potter is currently a student in the Engineer Officer Advanced Course, Class 3-78, and is serving as a Platoon Trainer for the Engineer Officer Basic Course. He is a 1973 graduate of the US Army Military Academy at West Point. He was stationed at Fort Carson, Colorado, prior to his current assignment.

Officer career info

Colonels

Physicals are an important part of the career files. In the grade of Lieutenant Colonel and below, the entry on the Officer Record Brief under "PULHES/Date" and "Height/ Weight" is the only record that MILPERCEN has or needs as long as medical board action has not been indicated. Once selected for Colonel, however, a copy of the physical should be placed in the official file. Selectees should insure that the physical clearly states their name, grade, SSN, physical status and date of the physical. The copy sent to Headquarters, DA must be clear and readable to be of value. Change 29 of AR 490-501 states that physicals are required in the birth month at ages 19, 23, 27, 31, 35, 39, 41, 43, 45, 47, 49, and annually thereafter. The age rules differ for officers on flight status. For Colonels and Lieutenant Colonels (Promotable), duplicate copies should be sent by the serving Medical Department Activity to Headquarters, DA (DAPC-PSR), Hoffman II Building, 200 Stovall Street, Alexandria, Virginia 22332.

Captains

The Major, AUS, Selection Board was scheduled to convene on 21 March 1978. The primary zone of consideration included officers with a date of rank of 30 September 1970 or sooner. The secondary zone of consideration included officers with a date of rank of 1 October 1970 to 30 June 1974. Good luck to all senior captains.

Warrant Officers

Under the Chief of Staff's recently announced combat exclusion policy, 57 of the 59 warrant officer specialties are open to women. The only two remaining closed are MOS 100E, Attack Helicopter Pilot, and MOS 224B, Short Range Air Defense Systems Technician. Qualified women are encouraged to submit applications for warrant officer appointment. Procedures are outlined in DA Circular 601-73.

The Regular Army (RA) program will be relied upon to provide the Army with tenured warrant officers. Upon termination of the Managed Tenure Program, the last cycle of which is now in progress, the Army will cease retention of nonregular warrant officers beyond their 20th year of active service. All nonregulars already approved for entry into tenured status will be permitted to serve out the approved period, but thereafter all warrant officers who are not members of the Regular Army upon completing 20 years service will be mandatorily released from active duty as provided in paragraph 3-31b, AR 635-100. Replacing the Managed Tenure Program will be an RA "decision point" process that will be explained in a forthcoming circular.

The American Council on Education (ACE) is nearing completion of its study of the warrant officer program. This study was contracted for by HQ DA as part of the Army's general educational development program. Via publication in the *ACE Guide*, the Council is recommending that colleges, universities, technical institutes and vocational schools grant specified credits to Army warrant officers for the learning they have demonstrated through assignment and experience in their MOS. Use of the ACE recommendations will provide warrant officers a greater degree of mobility toward achievement of MOS-related degrees.

OPMD Contacts

- Colonels Division (DAPC-OPC-AE)
  - Engineer Assignments, LTC Lin Lufkin, x 7871
- Lieutenant Colonels Division (DAPC-OPL-AS)
  - Engineer Assignments, LTC Thomas Fisher, x 0423
- Majors Division (DAPC-OPM-A)
  - Engineer Assignments, MAJ Gary Woodham, x 8109
- Combat Support Arms Division (DAPC-OPF-E) (Company Grade)
  - Engineer Branch Chief, LTC Norm Kuklinski, x 0650
  - CPT Assignments, MAJ Mike Foster, x 0651
  - LTC Assignments, CPT Matt Dominy, x 7434
- Warrant Officers Division (DAPC-OPW-AU)
  - Engineer Assignments, CW3 Frank W. Russell, x 7837

Note: Commercial telephone line: Listed numbers preceded by Area Code 202-325.
Autovon line: Listed number preceded by 221.
If you cannot call, please write to the following address: Commander, US Army Military Personnel Center, ATTN: (appropriate office symbol), 200 Stovall Street, Alexandria, Virginia 22332.

Microfiche Files

Some officers are wondering why they haven't received copies of microfiche personnel files, according to MILPERCEN officials. The reason is that all officer files have not been mailed yet.

Files have been mailed to general officers, colonels, warrant officers and, since late last month, to captains, except those in the Medical Corps.

Files are scheduled to be mailed to MC captains by March 15, to lieutenant colonels by April 30, to majors by May 31 and to lieutenants by June 30.

As microfiche copies of Official Military Personnel Files (OMPF) are received, discrepancies or questions on the copies should be brought to the attention of local MILPOs, officials advise.

New Assignment Policies

Department of the Army has announced the implementation of new assignment policies designed to reduce personnel turbulence and associated costs while providing the soldier greater tour stability. Key policies include:

- No PCS moves in CONUS solely due to passage of a stipulated period of time.
- Assignment procedures to permit tour completion and encourage voluntary tour extensions.
- First-term, 3-year (or less) members will be given only one assignment after initial training unless required to serve a short tour, in which case two assignments are permitted. First-term, 4-year (or more) members are eligible for two assignments after training, regardless of tour length.
- Emphasis on career personnel assigned to an unaccompanied hardship tour area being provided a homebase or advanced assignment.
- General officer assignments will be for a minimum of 2 years.
- In-so-far as possible, CONUS assignments will be for 3 years or more. This will not apply to individuals ordered overseas. For officers selected to attend Senior Service College, a 2-year minimum assignment will apply.
- Through the grade of O-5 for officers and E-8 for enlisted members, promotion will not be the sole reason for PCS reassignment prior to tour completion.
- Individuals declared excess at a particular installation will be reassigned at the same installation in their secondary or substitutable skills or, if not possible, to the nearest installation capable of using their skills.
- Hawaii is now included as part of the CONUS sustaining base for purposes of selection of overseas replacements.

Re-up Bonuses

Enlisted career info

Some National Guard and Army Reserve units can now get first-term reenlistment bonuses of up to $1,800. The award of bonuses has been established as a test program for 11 Reserve Component units that will be conducted from 1 January 1978 through 30 September 1978 and is aimed at bolstering Reserve Component strength figures.

Under the program, a maximum of $1,800 will be paid to first-termers who reenlist for a minimum of six years. Payment of the top bonus will be made by a lump sum of $900 at the time of reenlistment, and in $150 payments at the end of each year of satisfactory service.

The units eligible for the bonuses are National Guard units in Kansas, Georgia, North Dakota, Oregon, New Jersey, Michigan, and West Virginia, and the following Army Reserve units: the 96th ARCOM, Utah; the 76th Division, Connecticut; the 94th ARCOM, Massachusetts; and the 205th Infantry Brigade, Minnesota.

Photos

All E-6s and above are reminded that a current photograph of themselves is required to be in their official military personnel files. They are also reminded that the photograph must be updated every five years, with the new photograph being taken during the month of their birth.

Male soldiers must be photographed in the Army green uniform with their basic branch insignia in place, low quarter shoes, and wearing all permanently authorized ribbons, badges, and tabs correctly displayed.

Women soldiers must also wear the Army green uniform—coat and skirt—with the insignia of their permanent branch in place, black pumps, and with their permanently authorized ribbons, badges, and tabs properly displayed.

The official photograph has taken on increased importance, and the soldiers concerned should make an extra effort to insure that their photograph pictures them in the best light.

Test Scores

MOS Test scores will not determine reenlistment eligibility in 1978, according to new DA guidelines, which also list alternatives to using those scores.

SQT scores of 60 percent or higher or in the 11th percentile will replace a minimum MOS test score of 70 for soldiers reenlisting in 1978. Soldiers who do not meet the minimum requirements will be allowed to extend for one year for retesting or retraining.

Reenlistment Qualification Tests (RQTs) will be used if SQTs are not available in the MOS for which a soldier is reenlisting. RQTs are written tests that resemble the past MOS tests, and they are available in most MOSs. Soldiers who fail an RQT will be allowed to take another test after 30 days.

MILPERCEN will determine reenlistment eligibility for those soldiers who have neither SQTs nor RQTs available to them, or who fail those tests.

Career status soldiers who are reenlisting for a third tour or more will have their reenlistment qualifications determined by their SQT scores. If SQTs are not available, their most recent MOS test score will be used. Career soldiers are also eligible for one-year extensions for retraining or retesting.

Reclassified soldiers may reenlist based on their SQT scores in the current MOSs. Those with new MOSs, who do not have enough time in their new MOSs for testing purposes, may reenlist if their applications are approved by MILPERCEN. These cases will be handled on an individual review basis.

NCO channels

(EDITOR'S NOTE: This section is devoted to an exchange of information between the NCOs of the Engineer School and field units. Ideally, the point of contact for this program should be the Command Sergeant Major of the Engineer School and Command Sergeants Major of Engineer brigades, groups and battalions. This channel of communication will deal with rapidly changing Engineer doctrine and its impact on the professional Engineer NCO.)

Engineer NCO Advanced Course

Effective with the first class of FY 78, new grading standards were applied to Engineer NCO Advanced Course examinations. Students must pass each examination with a grade of 70 percent or higher to receive a passing rating. If a student fails on his first exam, he may be retested after additional training. If he fails a second time, his academic record will be reviewed by the Professional Course Review Committee (PCRC) which may recommend one of the following:

- Administrative Pass (Graduation with Diploma).
- Continue the course (Certificate of Attendance—unsuccessful completion).
- Referral to the Faculty Board (Faculty Board may recommend relief from the course).

Experience with the first class of ENCOA students under the new grading standards resulted in a 16 percent failure rate. Eleven of 67 students failed the course. One student was relieved from the course, and 10 were allowed to continue and complete graduation requirements by correspondence course.

Seven students failed demolition exams primarily because of their inability to calculate demolition formulas. The remainder failed exams due to lack of *basic* engineer and general military subject knowledge.

The following observations by instructors will be of assistance to NCOs selected to attend ENCOA:

- Students *must* disregard the old stereotype engineer concept of being in a rear area. With the new equipment and weaponry now being assigned to Engineers, the need for Engineers along the FEBA is *mandatory*. The role of the Engineer of the future is constantly being updated, and is a part of the combined arms team. Our contributions to the combined arms team are *mobility*, *countermobility*, *survivability* and *general engineering*. General engineering, although important, is *not* our primary mission.
- Map Reading—It is essential that personnel be able to orient a map and read an 8-digit grid-coordinate with moderate speed, and operate a compass with complete accuracy. Most combat type subjects taught at the Engineer School relate to ground operations dealing with a map. The Engineer School does not teach map reading; advance students are required to know this prior to arrival.
- Fighting Positions and Protection Facilities—Students should review the basic concepts of fighting positions, and what type of positions we currently recommend for use.
- Personnel Obstacles Non-Explosive—Students should review the types of wire obstacles that are currently in use, and the various types of wire such as barbed wire, barbed tape, concertina, etc. Many times we find that students have never constructed any type of wire obstacle and the feeling is that since they have not used it in the past—the same will be true of the future.
- Demolition—First we hope the student reviews current manuals concerning demolition and leave "That's not the way we did it in Vietnam or Korea" at home! Since the School teaches the NOW concept, it is important to have an open mind in the ever-changing area of military doctrine.
- Mine and Counter-Mine—ALL students must know the hardware and basic terminology of mine warfare before coming to this course. They should be familiar with types of mines, fuzing and arming procedures and they must be able to use a minefield recording form.
- Equipment and Weapons—Personnel should know the capabilities of the Dragon, TOW and common weapons associated with Engineer units. They should also be familiar with the types of equipment that are found in an Engineer Battalion, including Combat Heavy Units. You may ask why this is important. Many times during a class, questions arise as to what is a ten-ton tractor, scoop loader, backhoe, armored personnel carrier, etc.!

NOTE: Field Manual 5-34 (Engineer Field Data) could be used as a guide for self-evaluation. This manual also lists the major topics of instruction in Field Engineering and could be used as a text for preparing the student for the Advance Noncommissioned Officer Course.

Some advice to NCOs selected for the ENCOA course:

- Make sure you are proficient in basic math.
- Be prepared to do some hard studying in Engineer subjects in which you are weak.
- The School Staff and Faculty will help you, individually, or in small groups, but they won't pass you just because you are here.
- Standards are high; we are training professional Engineer NCOs.

Primary Technical Course

PTC for 12C (Bridge Crewman) is alive and well at Fort Belvoir. Units interested in the course or having difficulty obtaining information on it, please contact the Command Sergeant Major, US Army Engineer School.

Tactical problem

Situation

Imagine that you are the company commander of Company A, 2d Engineer Battalion, 2d Infantry Division. You have just been informed by the Battalion Commander that your company is to provide direct support to the 1st Battalion, 1st Infantry Brigade for one week to perform Engineer Survivability assistance.

The Battalion Commander discussed the Combat Service support requirements you would have in addition to your organic support capability while in direct support to the 1st Battalion. He has instructed you to furnish the Battalion S-4 a list of combat service support services and assets you will need for the seven days.

You return to your company and sit down with your company executive officer to begin planning. You refer to the Battalion SOP, which states that units operating under your situation would be augmented with additional vehicles to haul Class III and Class IV supplies, and a company mess team. Your Battalion SOP also lists the classes of supply below:

CLASSES OF SUPPLY

I	Subsistence
II	Clothing, equipment
III	POL
IV	Construction, fortifications
V	Ammunition
VI	Personal Items
VII	Major End Items
VIII	Medical
IX	Repair Parts
X	Non Military

Problem

You realize as you get into your planning that the support guidance outlined in the Battalion SOP is not enough. What additional combat service support assets would YOU request of your Battalion S-4?

Solution and Discussion

An Infantry Rifle Battalion has three Class III vehicles (POL Tanks/Pods) and five Class V vehicles (cargo trucks) to support its own elements. Therefore, you realize they could not provide the support your unit will need. You would be justified in informing your Battalion S-4 that you will need additional Class III, IV, V, IX and VIII to include a medical team. Additional vehicular support would be needed to transport your increase in Class III, IV and V.

Under the consolidation of administration at Battalion level (CABL) concept you may take personnel such as a mail clerk, supply clerk, a maintenance team and a dining facilities support team from the Battalion S-4. Of course, these additional teams and/or personnel may depend on the enemy situation and local operating procedures. However, it is the detailed consideration of your requirements prior to "moving out," which will provide you with the mission completion capability you need . . . and that is what it is all about.

(Continued from page 5)

Several times, as president, Washington suggested setting up the school of engineering. But it was not until 1802, three years after Washington died, that President Thomas Jefferson was authorized by Congress to establish a Corps of Engineers at West Point to "constitute a Military Academy."

To this day, the U.S. Military Academy at West Point remains essentially a school of engineering. The highest ranking graduates are offered assignments in the Corps of Engineers, which achieved such major national objectives as the Panama Canal and the World War II "Manhattan Project," which developed the atomic bomb.

But the education of engineers had its setbacks at West Point, too, in the early 1800s. Engineers were then considered warmongers and subjected to public scorn.

In its early days, West Point followed the example of other institutions of higher learning, most of which were under control of religious organizations, concentrating on teaching of the arts, languages and similar "gentlemanly" subjects. Virtually the only scientific study in those days was astronomy.

It was in 1815 that the training of engineers in North America got its major impetus. That year a 30-year-old captain of the Army Corps of Engineers, Sylvanus Thayer, sought leave of absence to go to France and observe teaching methods and research in the French Army's Ecole Polytechnique.

The request was sent to President James Madison, who discussed the matter with his Secretary of State, James Monroe. Both had vivid recollections of Washington's many pleas for putting engineering on a sound footing. Capt. Thayer was sent to France.

Returning in 1817, Thayer was appointed by Monroe, who had become president, as Superintendent of the U.S. Military Academy. It was a post he held for 16 years, during which he made West Point a top-notch school of engineering—and the first in North America.

Thus Sylvanus Thayer carried out, over many years, the ambitious plans advocated as early as 1775 by George Washington. Today the United States trains engineers in some 300 institutions, including Philadelphia's Drexel University, which granted its first degree in engineering in 1917.

It will be exactly 200 years this June 9, since General Washington first proposed the education of engineers in North America, and that anniversary will not go unnoticed.

Under chairmanship of Gen. Bruce C. Clarke (ret.) a West Point-trained Corps of Engineers officer whose defense of St. Vith, Belgium during the 1944 "Battle of the Bulge" led to full four-star rank, plans for the observance have been taking shape for six years.

President Jimmy Carter—who received engineer training at the U.S. Naval Academy at Annapolis—has been invited to make the principal address.

The observance will be at Valley Forge, under the sponsorship of the Freedoms Foundation, the National Society of Professional Engineers, and other engineer organizations.

This will not be the first time George Washington has been honored in Pennsylvania as the early American engineer. In 1954, President Eisenhower and many other notables gathered at Fort Necessity, near Confluence, Pa. in Fayette County, to commemorate the 200th anniversary of Washington's battle—he was then just 22, serving in the Virginia militia under the British Crown—against the French in the French and Indian War.

Having explored the western reaches of Virginia (which then stretched to the Mississippi River) a year earlier, Washington was sent as second in command of a force raised by Virginia Governor Dinwiddie to warn the French against proceeding east from the Ohio River.

While enroute to the Ohio Valley, Washington became commander of the force upon the death of his superior, Col. Joshua Fry.

Historians disagree on the outcome of the Battle of Fort Necessity, but there is no doubt that Lt. Col. George Washington, then barely a lad, selected its site and supervised its construction by the simple method of felling trees and forming their trunks into a stockade.

As some historians tell it, the site was selected because Washington knew the range of muskets carried by the French and Indians, and their practice of shooting from behind trees. He put his fort in a clearing known as Great Meadow, along what is now U.S. Highway 40, so large that the attackers would have to come into plain sight before they could fire effectively.

But the French and Indians must have been able to maintain their concealment, because Washington was said to be unaware of how many casualties they had suffered. The battle ended in a draw with Washington's troops retiring to the east and the French and Indians to the west. Both sides then claimed victory, the French Commander saying he had forced Washington out, and American partisans claiming the eastward advance of the French had been stopped.

Whatever the real outcome of that battle, it is clear that Washington, who had begun his career as a surveyor at age 16, became an experienced military engineer by the time he was 22, supervising the construction and defense of a fort.

Small wonder that he went on to other important military service under the British Crown, was chosen to lead all colonial military forces at age 43, and is now regarded as the first advocate of the training of engineers who made the United States a leader in world technology.

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Itschner and Sturgis Awards

THE ENGINEER congratulates the winners and runnersup in the annual Itschner and Sturgis Awards competition for calendar year 1977. The winners were:

Itschner Award—Company C, 547th Combat Engineer Battalion, 130th Engineer Brigade, V Corps, USAREUR

Sturgis Award—Staff Sergeant Humberto A. McLaren, Company B, 802d Engineer Battalion (Heavy), EUSA

Itschner Award for Reserve Components—HHC, 315th Engineer Group, New Cumberland Army Depot, New Cumberland, Pennsylvania

Itschner Award for National Guard—842d Engineer Company (Combat Support), 109th Engineer Battalion (Maintenance), South Dakota National Guard, Sturgis, South Dakota

Other nominations in the Itschner Award competition included the following units:

TRADOC—Company D, 3d Battalion, 4th AIT Brigade, Fort Leonard Wood, Missouri

FORSCOM—Company C, 864th Engineer Combat Battalion (Heavy), 9th Infantry Division, Fort Lewis, Washington

EUSA—Company C, 44th Engineer Combat Battalion (Heavy), 2d Engineer Group, EUSA

USAREUR—Company D, 79th Engineer Combat Battalion (Heavy), 18th Engineer Brigade

USAREUR—535th Engineer Company (Light Equipment), 563d Engineer Battalion (Composite), 7th Engineer Brigade, VII Corps

Other nominations in the Sturgis Award competition included the following individuals:

TRADOC—Specialist Five David A. Ricard, HHC, USAES, US Army Engineer Center Brigade, Fort Belvoir, Virginia

USAREUR—Sergeant First Class Edwin S. Leahy, Company A, 293d Engineer Combat Battalion (Heavy), 18th Engineer Brigade

FORSCOM—Sergeant First Class Russell A. Garrett, 902d Engineer Company (Float Bridge), 11th Combat Engineer Battalion, US Army Engineer Center Brigade, Fort Belvoir, Virginia

Pacific Ocean Division—Staff Sergeant Howard L. Givens, Relocatable Project Office, Construction Division, US Army Engineer District, Far East

THE ENGINEER also congratulates Lieutenant General Alfred D. Starbird as the 1978 recipient of the Chief of Engineers Award for Outstanding Public Service.

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Army Engineer School
Fort Belvoir, Virginia

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Assistant Commandant
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EDITORIAL STAFF

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Cover

REFORGER '77 was a unique amalgam of men and machines undergoing training designed to prepare NATO allied forces for future armed conflict on the European battlefield. By Staff Sergeant Mike Furr.

200 Years of Engineering Education

General Bruce E. Clarke (Ret.) unveils plaque commemorating the 200th anniversary of George Washington's "call" for engineering education during ceremonies at Valley Forge, PA, on June 9. Inscribed on the plaque is Washington's original order, which stated "Three Captains and nine Lieutenants are wanted to officer the Companies of Sappers: As this Corps will be a school of engineering it opens a prospect of such Gentlemen as enter it and will pursue the necessary studies with diligence, of becoming Engineers and rising to the Important Employments attached to that Profession as the direction of Fortified Places, etc. The Qualifications required of the Candidates are that they be Natives and have a knowledge of the Mathematics and drawing, or at least be disposed to apply themselves to those studies. They will give in their Names and Headquarters." The plaque will remain at Valley Forge, while an identical plaque, with the same inscription has been donated to the U.S. Army Engineer Center at Fort Belvoir, VA. Both plaques were donated by the Freedoms Foundation and the National Society of Professional Engineers. Behind the podium in photo is Robert W. Miller, President of the Freedoms Foundation.

From the Commandant

The mission of U.S. Military forces during peacetime is, in brief, to maintain a posture of total readiness in the event of future war. If we are successful in gaining and sustaining a high posture of readiness, the chances of another war are diminished substantially. In "cold war" terms, it is known as deterrence.

In order to sustain a high posture of readiness, constant and intensive training is mandatory, not only for U.S. forces, but for our allies in the North Atlantic Treaty Organization as well. We MUST be prepared to win the first battle should we be drawn into another armed conflict.

To that end, the Redeployment of Forces to Germany (REFORGER) has been conducted each Autumn for the last several years. REFORGER, itself, is a part of a massive NATO training exercise involving almost all NATO countries.

REFORGER '77 was a particularly rewarding experience for U.S. Army engineers. A special section of this issue of THE ENGINEER is devoted to that exercise in the hope that all Army engineers, and especially those scheduled to participate in future REFORGER exercises, may profit from lessons learned a year ago.

Our special thanks also go to COL Kem, Commander, 7th Engineer Brigade, and the other engineer commanders who provided the material for this section of THE ENGINEER. We can spread the word on engineer accomplishments only if field commanders keep us informed.

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MG James L. Kelly
Commandant
USAES

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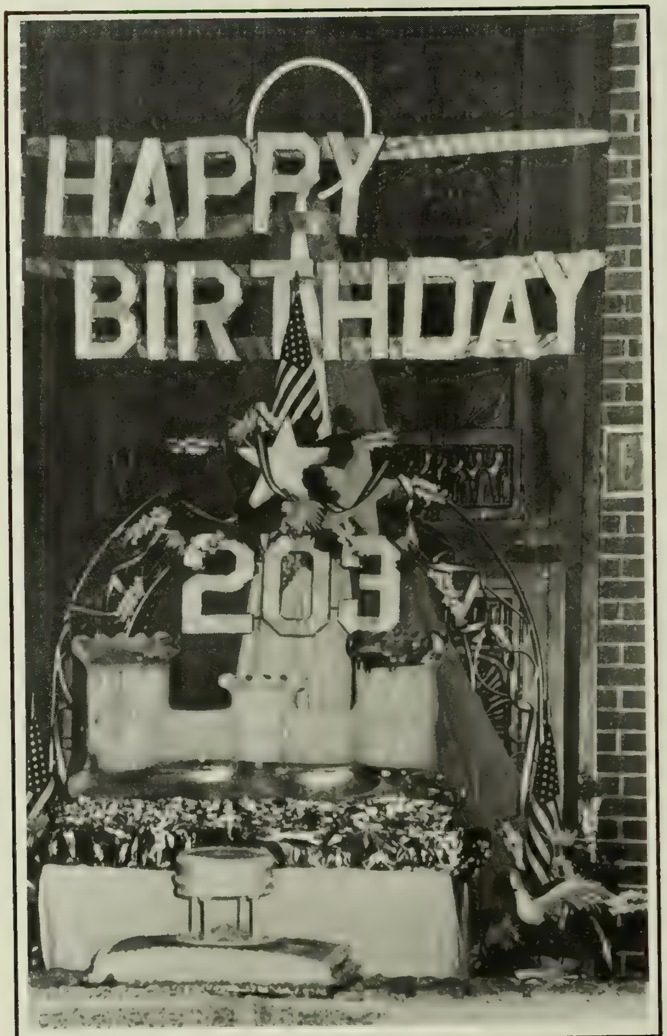
News & Notes



Birthday

A medieval castle carved from ice adds sparkle and imagination to Fort Leonard Wood's celebration of the Army's 203rd birthday June 9. The castle, of course, is the most popular symbol of Army engineers and Fort Leonard Wood is the primary training center for Army engineer recruits. The ice castle was carved by Sergeant First Class Garold Lawson, assistant manager of the Main NCO Club at Fort Leonard Wood, site of that installation's Army Birthday Ball this year. The highlight of the occasion, attended by more than 400 persons, was a stirring narration of "I Am the Army" by Staff Sergeant Daniel Rickard and Specialist Five William R. Welch. (Photo by Sergeant Joseph Giglio)

SAME winners

The Fiscko brothers, Kurt and Kerry, are recipients of the SAME award for 1978. Thats S-A-M-E as in the Society of American Military Engineers.

The Society presents the award each year to as many as 20 junior college students and 20 senior college students who are participants in the Reserve Officer Training Corps (ROTC) program. This year, the Society presented a total of 29 awards.

Kurt, 22, graduated in May from Wichita State University and received a Regular Army commission as a second Lieutenant. He chose Air Defense Artillery as his branch and will attend the ADA basic officers course at Fort Bliss, TX, this summer. Kurt received his college education via a four-year Army ROTC scholarship and became the first engineering student to graduate from Wichita State with a perfect 4.0 grade point average. His outstanding record resulted in an Army fellowship for graduate study.

Younger brother Kerry, 20, just finished his junior year at the University of Missouri-Rolla. Like Kurt, he has a four-year Army ROTC scholarship and is making the most of it with a 3.67 grade point average in mechanical engineering.

Kit

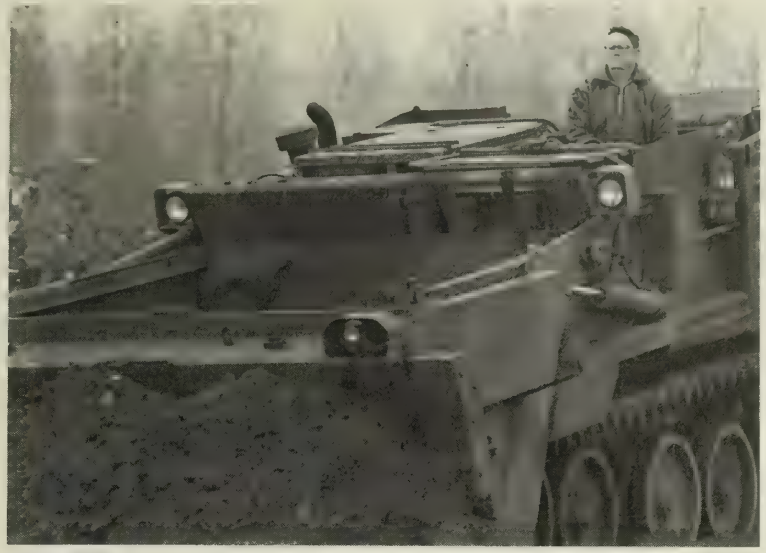
A special kit developed by MERADCOM will permit the conversion of 164 Army trucks into Ribbon Bridge Transporters at an estimated savings of $4 million.

The trucks to be converted are five-ton stake bed trucks which will also receive modifications that allow them to carry up to 10 tons of cargo when they are not being used to transport ribbon bridges.

The conversion kit was developed by MERADCOM's Marine and Bridge Laboratory and shipped to Germany, where a German firm will actually perform the necessary modifications. The conversions are expected to be completed by the end of this summer.

UET

The versatility of the Universal Engineer Tractor (UET) was demonstrated for the first time to American and NATO allied forces in Europe this Spring. The demonstrations were conducted at several sites in conjunction with the NATO Armed Forces Central Region Combat Engineer Conference in Mannheim, West Germany. New British and West German combat engineer vehicles were also put on display for troops in the field for the first time. Production of the UET is expected to begin late this year or early next year. (Photo by SP5 Richard Johnston)



Flood

Members of the 275th Engineer Company (ADM), 7th Engineer Brigade, pile sandbags to reinforce a weakening dike near Neckarrems in southern Germany. Heavy rains in the nearby mountains resulted in swollen rivers, flooding, and mudslides throughout the area in late May. Other Army engineer units responding to the call for assistance included the 565th Bridge Battalion (Karlsrhue), the 9th Engineer Battalion (Eichenbuhl), the 78th Engineer Battalion (Ettlingen), and the 38th Panel Bridge Company of the 563rd Battalion (Remseck).

NATO Exercise

Military engineers from four countries participated in the NATO Central Army Group (CENTAG) engineer training exercise "CETEX 78" in Baumholder, West Germany, in late May.

Joining U.S. forces in the exercise were military engineers from Belgium, Canada, and West Germany. The purpose of the exercise was to cross-train instructors of combat engineer units on mines, demolition accessories, employment techniques, and procedures of allied formations. The conclusion of the exercise was a test on takeover and handover of barriers.

Engineers of Company B, 326th Engineer Battalion, 101st Airborne Division (Air Assault), mold and set C-4 explosives on the old Yellow Creek Bridge at Fort Campbell, KY, during operation "Vital Link" last Spring. The explosion (below) sent smoke, water and twisted metal into the air and halted the advance of a fictitious Army.

Mine Clearing System

The Track Width Tank Mounted Mine Clearing Roller System developed by MERADCOM is scheduled to go into production in August.

The Mine Clearing Roller consists of a retrofit kit, a mounting kit, roller kit and fixture kit. It weighs less than 10 tons and can be mounted in the field by the tank crew in less than 15 minutes for use day or night under all weather conditions.

The roller is about 90 percent effective against pressure fuzed mines buried up to four inches when traveling up to 10 miles per hour. A weighted chain suspended between the roller assemblies clears tilt rod mines. It can survive blasts from two 22-pound high-explosive mines. Under battle conditions, the rollers can be released in less than 30 seconds using a hydraulic disconnect system.

A temporary raft is constructed to transport weapons and heavy equipment as Company A, 307th Engineer Battalion, 82nd Airborne Division, prepares to execute a "hasty river crossing" on Fort Bragg's Kiest Lake. The operation was conducted in two phases: lightweight pneumatic boats ferried fully equipped combat personnel to the opposite shore during the assault phase; and hastily-constructed pontoon structures carried heavy equipment and weapons across the lake during the rafting phase.

Smoke adds realism

Modern tactics, both ours and those of the OPFOR, stress the importance of concealment of equipment, positions, and movements. It may be that the decisive edge in the next battle will be with the commander who best grasps the use of smoke to augment more traditional methods of concealment and deception; and whose troops are best trained in operations in a smoke environment.

Fine, so let's train, utilizing smoke realistically when appropriate. Say, during river crossing operations. (FM 31-60, River Crossing Operations, has a good section on smoke.) But, you say, "Where do I get the smoke capability? It's not in my TOE/TDA." The answer can be found in unclassified message P 221953Z Mar 78 from Commander, FORSCOM, Subject: The Use of Realistic Battlefield Environmental Conditions Throughout the Army. Pertinent extracts of the message are as follows:

- The Chemical Directorate, USAOCC&S, has a Large Area Smoke Team available to provide short term obscuration training, and large area survivability and deception exercises. Scheduling is handled by AFOP-TAS (HQ FORSCOM), AUTOVON 588-3840/2904. Funding must be provided by the user.
- There are 16 reserve component Smoke Generating Companies in the First and Fifth Army areas. Information and scheduling can be obtained from: First Army POC, AUTOVON 923-4101/4324, Fifth Army POC, AUTOVON 471-3700/5920.
- M3A3 Smoke Generators (NSN 1040-00-587-3618) are available in the wholesale supply system with issue based on TOE/TDA. If you aren't authorized issue by TOE/TDA, a short term loan can be arranged with the applicable Materiel Readiness Command. Technical assistance is as close as your nearest Maintenance Assistance and Instruction Team (MAIT) and/or Field Maintenance Technician (FMT). HQ FORSCOM POC is at AUTOVON 588-2648/2919.

- Obsolete HC smoke cannisters can provide realistic artillery delivered smoke. Without additional cost or change to your units' annual ammunition authorization, you can order:

  a. Cannister, smoke HC, 105 mm M1, NSN 1315-00-383-3889
  b. Cannister, smoke HC, 155 mm M1, NSN 1320-00-383-3890
  c. Cannister, smoke HC, 155 mm M2, NSN 1320-00-383-3891

Each cannister is used by stringing on det cord and electrically priming it with a blasting cap.

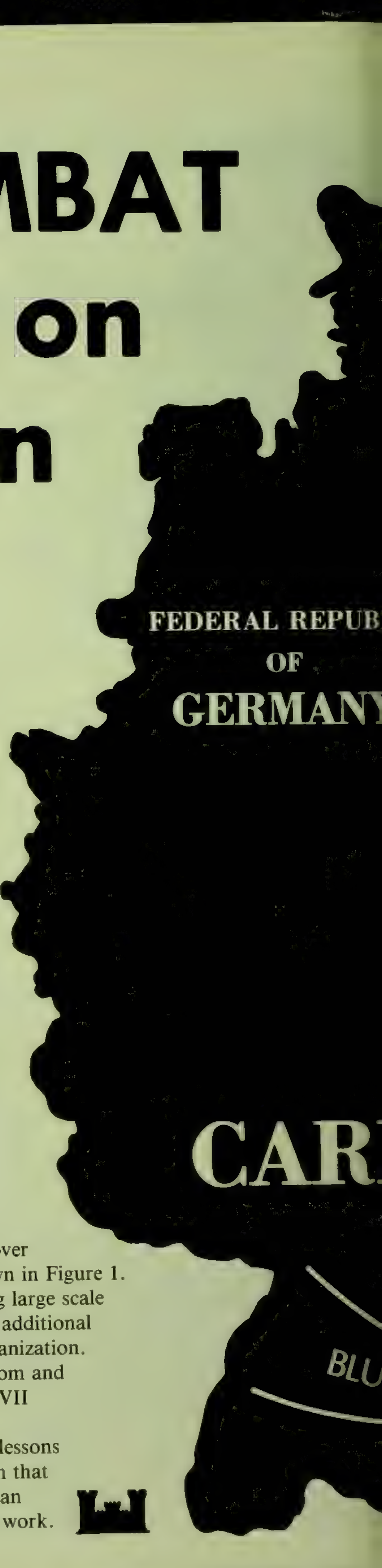
As members of the combined arms team, engineers must be familiar with smoke operations and proficiency can only be achieved by realistic training.

THE ENGINEER

welcomes your comments on any material published. You may have your viewpoints/ideas published as "Letters to the Editor" or you may wish to submit a feature length article for consideration. If you have something to contribute, let us hear from you.

Editor

COMBAT on European



Colonel Richard S. Kem

They came from units within VII Corps, from CONUS, from other major commands in Europe, and from NATO allied forces, to participate in the United States Army's major Field Training Exercise (FTX) of 1977, REFORGER. A total of 6,340 combat engineers, about 11 per cent of the Army engineer force, participated in REFORGER '77, otherwise code named CARBON EDGE.

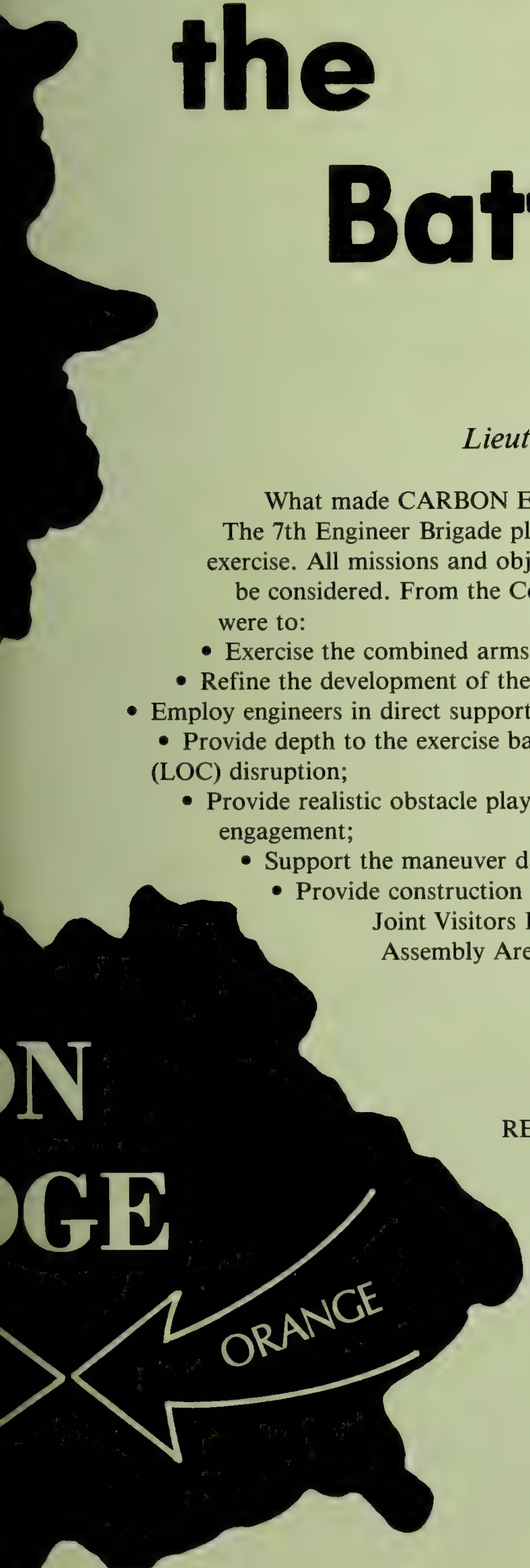
CARBON EDGE pitted reinforced division forces against each other in free play maneuvers with frontages, terrain and control factors realistic to the modern European battlefield. Eight engineer battalions participated, providing the capability to realistically exercise and support battlefield requirements with both direct and general support engineer forces. The result was an exceptional training exercise and an unparalleled opportunity for all to experience the distance, lethality and rapid pace expected on today's European battlefield. It was the opportunity to implement offensive and defensive concepts that had dominated planning and training for VII Corps during previous months.

From September 13 to September 23, combat engineers built 31 bridges, conducted eight river crossings and installed over 2,000 obstacles, covering a full range of engineer tasks as shown in Figure 1.

Mistakes were made, but mistakes are not uncommon during large scale training exercises. Some of those mistakes can be corrected by additional training, while others require reassessment of doctrine and organization. The followup challenge from CARBON EDGE is to benefit from and build upon the lessons and experience gained, not only within VII Corps, but throughout the Army.

This special section describes that experience and the major lessons learned. It is hoped that engineers everywhere will benefit from that experience. The engineer success of CARBON EDGE was not an accident, but the result of many months of planning and hard work.

ENGINEERS the Battlefield



Lieutenant Colonel Wain W. Stowe

What made CARBON EDGE a success was months of planning and preparation. The 7th Engineer Brigade planning effort began in January, nine months prior to the exercise. All missions and objectives had to be evaluated before the organization could be considered. From the Corps and brigade point-of-view, the paramount objectives were to:

- Exercise the combined arms in river crossing operation;
- Refine the development of the active defense;
- Employ engineers in direct support (DS) and general support (GS);
- Provide depth to the exercise battlefield through interdiction and line of communications (LOC) disruption;
- Provide realistic obstacle play through an effective controller organization and rules of engagement;
- Support the maneuver damage control plan;
- Provide construction support for the Corps Tactical Operations Center (TOC), Joint Visitors Bureau (JVB), Initial Assembly Areas (ISAs), Major Unit Assembly Areas (MUAAs) and water points to the nondivisional units.

Engineer Organization

REFORGER 77 units included two engineer battalions—the 1st Engineer Battalion from Fort Riley, Kansas, and the 20th Engineer Battalion from Fort Campbell, Kentucky. The organization of engineers in support of Blue and Orange Forces is shown in Figure 1.

Divisional and direct support engineers in front of the Corps Engineer Work Line (CEWL) were generally balanced. The 1st Engineer Battalion arrived without its mobile assault bridging and AVLBs, but as compensation, the Corps MAB company was placed on the Blue side in GS and a section of AVLBs was attached to the 1st Engineer Battalion from the 1st Armored Division. The Canadian Mechanized Brigade and the 29th Panzer Brigade (German), assigned to the Blue and Orange sides, respectively, were accompanied by their engineer companies, the Canadian Field Squadron, and the 290th Panzer Pionier Kompanie. The 9th Engineer Battalion and the 237th Engineer Battalion were placed in direct support to each side.

In general support behind the Corps Engineer Work Line, brigade planners worked from a void since never before in the history of REFORGER exercises had engineers been provided for that role.

The float bridge and fixed bridge assets were placed under the brigade's composite battalions, the 565th Engineer Battalion (Blue) and the 563rd Engineer Battalion (Orange). Each battalion had a Ribbon Bridge platoon and a mobile assault bridging (MAB) company. In addition, each battalion had a company of panel bridging and a platoon of Class 60 float bridge.

Rounding out the general support was a combat battalion each, an Atomic Demolition Munition (ADM) support to the Corps, and the 6900th (LS) Smoke Generator Battalion which provided a company on each side.

The 78th Engineer Battalion from Ettlingen provided maneuver damage support to the exercise area. With a maneuver area consisting of some 18,900 square kilometers of expensive Bavarian farmland, brigade planners were well aware that at least one full engineer battalion was required to accomplish the mission. The 78th was supported by the 503rd Engineer Company (Light Equipment/Combat Support Equipment). The area was divided into four sub-sectors to provide responsive reporting and repair.

Lastly, the 82nd Engineer Battalion from Bamberg was selected to perform all necessary construction support. Approximately $97,000 in construction materials were programmed to convert the German Air Force hangers at Leipheim into the Corps Control Center and to install tents, lights, latrines, and wash facilities at the major unit assembly areas.

Headquarters, 7th Engineer Brigade

In March, the organization of the headquarters was studied and proposals submitted to support the exercise. Previous REFORGER exercises had proven difficult to manage with the normal staff playing Blue, Orange and Control, all at the same time. Therefore, it was decided to organize and provide separate tactical operations centers. The control staff would function to insert interdiction and lines of communication (LOC) disruption incidents if VII Corps control failed to supply sufficient numbers.

With the help of the German Territorial Command, the town of Bach in the north-central sector of the maneuver area was selected as the exercise headquarters. Due primarily to the good will of Bach residents, occupation of the village was basically obtained for the mere cost of electricity. An old school house would be the company mess, a Gasthaus the operations center, a youth hotel the sleeping quarters, and the mayor's old office the command section.

Realism and Exercise Control

In previous exercises, maneuver damage considerations and ineffective obstacle control seriously impaired objective assessments of how terrain reinforcement could modify combat power. To insure a realistic appreciation of obstacles by both attackers and defenders, early and intense coordination was initiated and maintained with the Exercise Control Headquarters of the 1st Armored Division.

Resident umpires were to be kept informed and controlled by Area Control Centers to insure realistic obstacle play. Resident umpires would have no evaluation

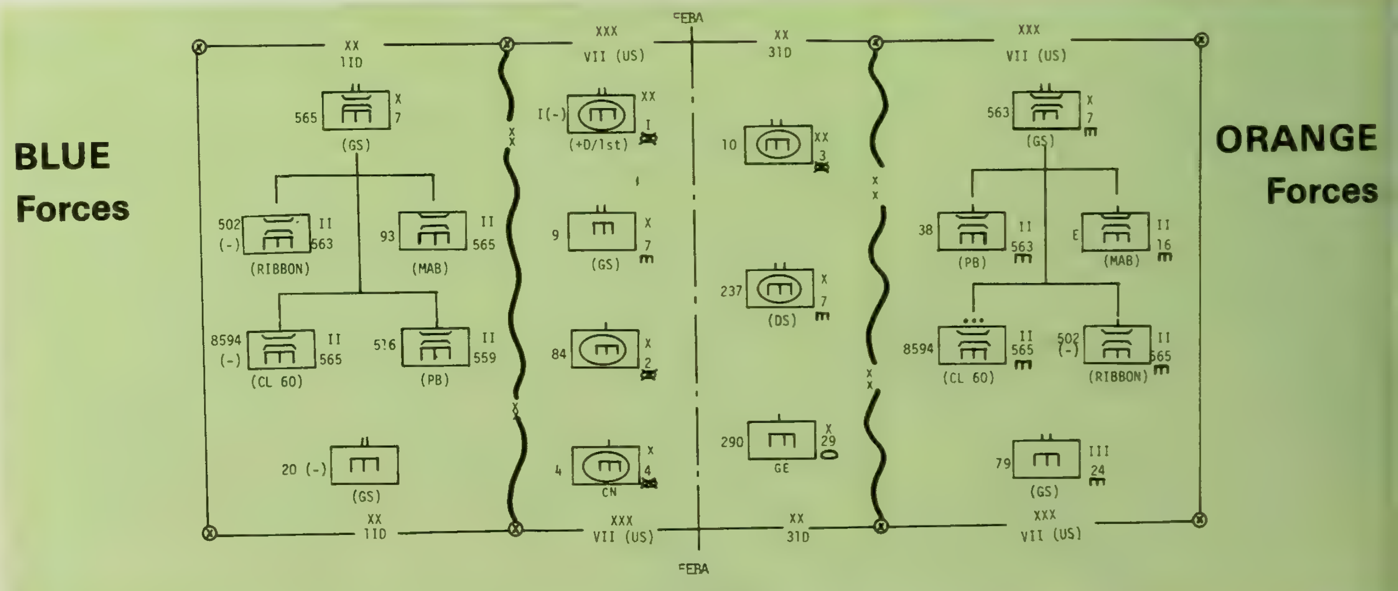


FIGURE 1

role involving player elements. They would judge only obstacle encounters.

Bridge Assets

A matter of early concern was having sufficient float and fixed bridge assets above organic bridging to support the player engineer battalions. The number of low-class bridges in the area, plus the expected rear-area engineer play, demanded additional resources. So the brigade planning staff programmed additional bridging as indicated in Figure 2.

Sets of 130′ DD Bailey Bridge	4
Trestle Sets (4 uprights)	10
45′ M4T6 dry spans	14
Class 60 end ramps	2
30-meter set of Medium Girder Bridge (MGB)	1
Timber Trestle Set (56′)	1
Bailey Pier Sets	8

FIGURE 2

Three bridge parks were established in the maneuver area, one in support of Blue, one for Orange and one in general support to both forces. Each was located at least 20 kilometers from the brigade rear boundaries to provide realistic haul distances.

Staff planners also demanded that at least one of the Bailey Bridge sets be removed from an actual pre-stock location to confirm configuration and maintenance readiness of the set. Movement of non-organic bridging by the 82nd, 563rd and 565th Engineer Battalions from theater depots and pre-stock points began 10 days prior to the start of the exercise. Heavy transportation assets were also called in to haul some 8,800 tons of bridging to the three parks.

Bridge Training Site Identification

The need to identify usable but realistic bridge training sites prior to the exercise was revealed in previous REFORGER and divisional exercises. Identifying sites during an exercise is too time consuming. Sites must be realistic and near main supply routes, while unacceptable levels of maneuver damage must be avoided.

In early June, three player engineer battalions conducted bridge site reconnaissance. By the middle of July, 65 sites were identified, photographs produced, and gaps measured and cataloged for selection ease.

River Reconnaissance

A map reconnaissance of the maneuver area would lead the casual observer to praise the tactical river crossing opportunities, with the Iller and Donau both bisecting the area. But air reconnaissance revealed that both rivers were paralleled by dikes, canals, autobahns, and railroads and crisscrossed by hydroelectric lines and low class bridges. Further, water levels varied dramatically with rain showers in the Alpen watershed. The conduct of river crossing operations posed a real challenge.

The prior identification of all possible crossing sites was considered necessary to prevent needless simulation. In May, brigade units began a detailed reconnaissance and survey of all possible crossing sites. Any reasonable site was identified—reasonable from the point of acceptance of maneuver damage. Approximately one-half of the Iller was eliminated from actual crossings but 12 sites remained for which fording, dry span, or float bridge could be used, depending on water levels. A similar number of sites were identified on the Donau with fewer restrictions. Both would offer tough engineering challenges with currents varying from zero at hydroelectric dams to 10 feet per second in the straight-aways.

Maneuver Damage Actions

In June-July, the 78th Engineer Battalion engaged in an important aspect of maneuver damage control—that of performing pre-exercise reconnaissance and documentation of existing damage. The 78th spent several weeks traveling the roads and woods recording previous damage.

Simultaneously, the battalion began gathering necessary equipment and material such as additional graders, sweepers, wreckers, water distributors, bucket loaders, gravel, POL absorbent, rubber grader blades, medics, calculators, civilian telephones, and translators.

Communications

Additional communications personnel and equipment were required to support a much expanded brigade headquarters and to augment the normally diminutive bridge battalion headquarters (563rd and 565th Engineer Battalions). The brigade communications section requested four additional radio-teletype sets. Additional personnel trained in communications skills were drawn from the non-player battalions and assigned to the headquarters and the two bridge battalions.

The communications theme throughout the preparatory phase was to insure multiple means of communications. The long distances between units, combined with interference, would put maximum demands on telephone, AM, FM and courier systems, none of which could be expected to function at all times. Army Area Signal Center (AASC), maneuver brigade, and division operations centers were all identified as possible telephone access points for engineer units.

Just prior to the exercise, both organic and augmented communications systems were tested from command post locations. While interference from hydroelectric lines and substations was prevalent throughout the area and the augmented systems experienced problems, the pre-exercise COMMEX provided useful preliminary training.

Construction Support

As August approached, access to the major unit assembly areas and the Corps exercise area at Leipheim was obtained and construction of exercise facilities began.

Utilizing much of the material from previous REFORGER exercises, the 82nd Engineer Battalion built sheet rock partitions at the Corps Tactical Operations Center and completed the Joint Visitors Bureau and Press Centers at Leipheim. Brigade prepared service areas adjacent to these facilities to house the remainder of the Corps Headquarters and support personnel.

The largest REFORGER major unit assembly area at Boeblingen Maintenance Plan required the erection of 465 tents, latrines, wash facilities, and an electrical distribution system to support the 4,000 troops and 900 vehicles located there. With the late delivery of electrical supplies, tents were lit just hours prior to the arrival of CONUS based troops on August 20. All construction was completed, however, on or ahead of schedule, thanks to the 82nd Engineer Battalion's determination and effort.

Pre-Exercise MAPEX

Three weeks prior to the start of the exercise, the brigade sponsored a MAPEX to identify problem areas, coordinate tactical plans with engineer support, and above all, to take full advantage of the training opportunities. The brigade headquarters found the MAPEX an ideal method to review and finalize letters of instruction, support arrangements, umpire directives, and Blue and Orange OPLANS.

Command and Staff Coordination

As a management technique to insure that staff actions were accomplished and coordinated, in-process reviews were conducted weekly by the Commander, 7th Engineer Brigade. Periodically, special staff and action officers were required to present their progress in selected areas. Most importantly, a requirement to brief and explain the engineer support to major commanders was identified. The inclusion of GS engineer support behind the maneuver brigades, plus expected interdiction and LOC type missions, required explanation. Commanders of VII Corps, 3rd Infantry Division, 1st Infantry Division, Chief Umpire, 1st Infantry Division (Forward) and the 2nd Armored Cavalry Regiment were all briefed prior to the exercise.

Such preparations virtually insured a profitable training experience for each and every engineer who participated in exercise CARBON EDGE.

Lieutenant Colonel Wain W. Stowe was the S-3 of the 7th Engineer Brigade, VII Corps, during REFORGER '77

Command and Control

The burdened brigade engineer

Lieutenant Colonel Paul G. Cerjan and Major Fred Gray

CARBON EDGE provided a valid test of the doctrinal methods of coordination and control of engineer efforts. The vast, fastmoving battle exposed communications deficiencies in current Engineer organizations, demonstrated difficulties of command and control of engineer operations over today's frontages, and dramatically revealed too great a burden on the brigade engineer. If combat engineers are to be responsive on today's European battlefield, engineer doctrine and organization must be revised to solve these problems.

The normal direct support/general support (DS/GS) command relationship was adopted by the 3rd Infantry

Division of the Orange Forces during FTX CARBON EDGE/REFORGER 77. Engineer battalions retained command of their companies, generalized area assignments were used, and engineer activities in brigade sectors were managed by the commander of the engineer company in direct support of the brigade.

Offensive Operations

Tasking for the seven companies in direct support was provided by the Brigade Engineer. He received requirements from the Brigade Commander or S-3, translated them into tasks, and passed them on to units working in direct support of the brigade.

In general, the system worked well, although the majority of the offensive tasks went to the organic 10th Engineer companies, whose squads were mechanized and deployed farther forward than those of the 237th Engineers.

Initial obstacles emplaced by the Blue covering force were not extensive and did not require much breaching effort. Many Blue obstacles were bypassed or quickly breached by mechanized elements. Rear area interdiction of road nets, consisting almost entirely of major bridge demolition, was assigned to general support units. No engineer work line separated companies of the 10th and 237th Engineers. Platoons from both battalions worked the brigade sector as required.

Due to the critical nature of the bridging required to get the division across the Iller River, the 563rd Engineer Battalion was placed in direct support and took directions from the division engineer. The bridging assets of the 563rd spent most of the exercise in direct support, with a bridging team assigned to provide crossing capability for each brigade area.

GS engineer units were tasked either by coordination between the Division Engineer and the 7th Engineer Brigade or by direct coordination with sector engineers. Prior to the initial Orange attack, the commander of the 79th Engineer Battalion presented a plan to designate two company commanders as sector engineers, placing their companies behind the division, with each working a two-brigade zone. These sector engineers could commit up to one-half of their capability to missions passed directly from maneuver brigade engineers. This was designed to permit better coordination and responsive reaction to missions.

In practice, due to communications problems and insufficient understanding, this arrangement was not fully and effectively used, and sector engineers received few missions through direct coordination.

Most of the 79th Engineers' general support missions were coordinated through the 7th Engineer Brigade and consisted of large tasks such as construction of a 150-foot Bailey Bridge, emplacement of a Medium Girder Bridge and installation of a Class 60 bridge across the

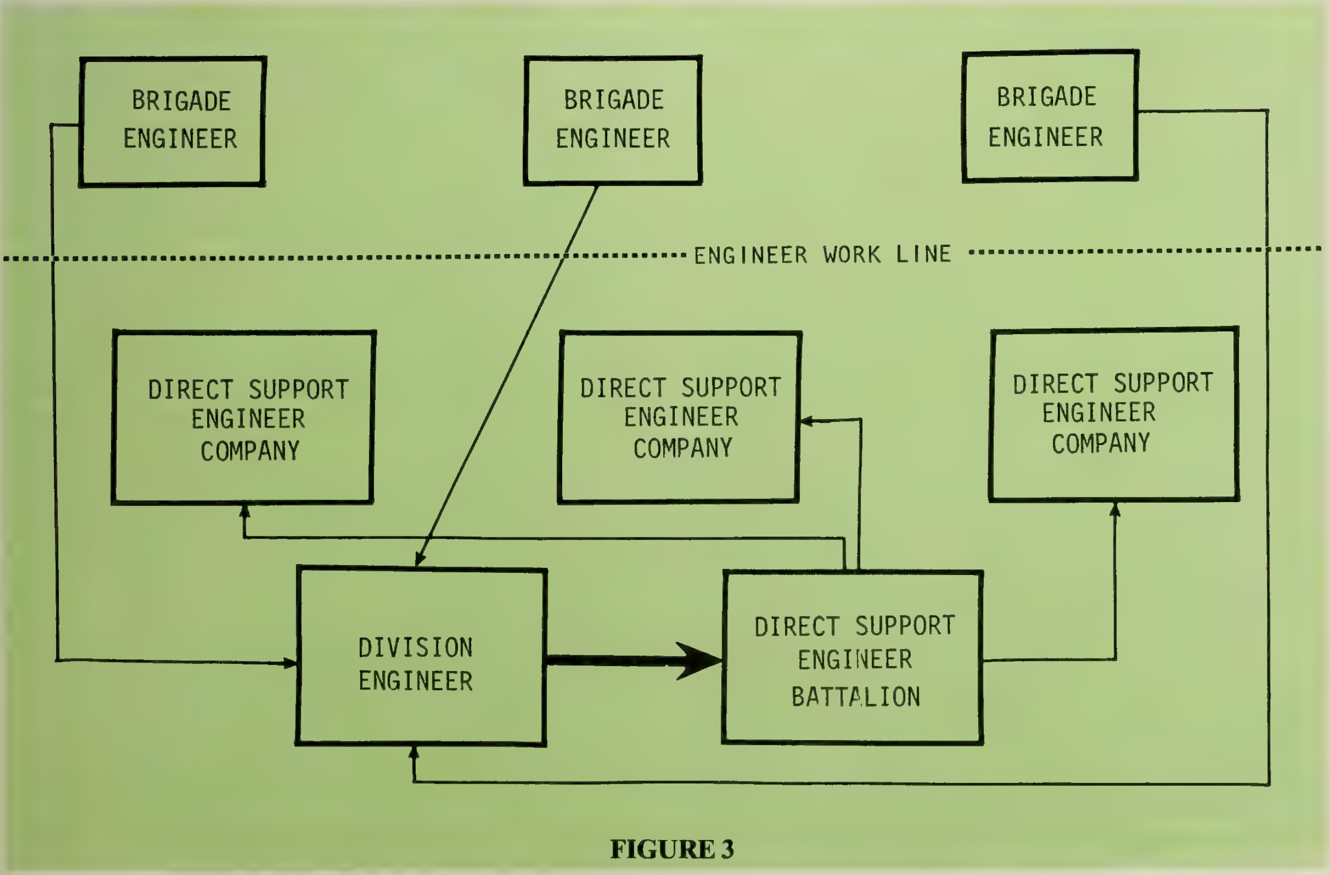

BRIGADE ENGINEER
BRIGADE ENGINEER
BRIGADE ENGINEER
ENGINEER WORK LINE
DIRECT SUPPORT ENGINEER COMPANY
DIRECT SUPPORT ENGINEER COMPANY
DIRECT SUPPORT ENGINEER COMPANY
DIVISION ENGINEER
DIRECT SUPPORT ENGINEER BATTALION

FIGURE 3

Iller River. This tasking channel was extremely vulnerable to shortcomings in engineer organizational communications.

Coordination delays quickly escalated to become real delays in engineer accomplishment and responsiveness. Timeliness, in both actions and reporting is essential on the modern battlefield. The sector assignment, with commanders authorized to institute work on their own authority, is the best way to meet responsiveness needs. Of course, communications shortcomings must be solved irrespective of coordination channels. Responsiveness of GS engineer units was greatly improved with the establishment of a radio-teletype link between the 10th Engineer Battalion, 7th Engineer Brigade and the 79th Engineer Battalion. Hard copy details of mission requests were thus provided in advance, while allowing the Corps and 7th Brigade commanders to decide how the tasking would be done. Such a link is almost mandatory for the effective use of GS assets.

Overall, the established organization and tasking arrangements worked well during the offense. As the engineer effort was being directed almost exclusively by the brigade engineers, the battalion commander/division engineer found himself monitoring the progress of engineer companies. Even with helicopter assistance, battalion commanders found the span of control over vast distances of the battlefield too great. In addition, command and staff resources of the 237th Engineer Battalion were not fully used to coordinate engineer effort. Brigade engineers performed that task.

Defensive Operations

During the transition to defense, a significant control change was made which utilized a combination of task and area coordination. A division engineer work line was established that generally divided responsibilities for engineer work and supervision across the battlefield—the 10th with forward deployed units and the 237th in the area immediately to the rear. Missions continued to flow from brigade engineers to the direct support companies, except that companies could more closely tie their effort to specific areas and better concentrate their efforts.

The span of control for the division engineer was also reduced, as the commander of the 237th was able to share supervision for a defined part of the battlefield. To the rear, the 79th Engineers worked on obstacles behind the Iller River. But when two companies of the 10th Engineer Battalion supporting the 3rd Brigade were rendered combat ineffective by the quick penetration of Blue Forces in that sector, rapid rearrangement of engineers was required to fill the void. One company of the 79th Engineers, reinforced with equipment for antitank ditch construction, was already in direct support of the division and working in the 3rd Brigade sector. Another company was requested and provided indirect support.

At that time, the brigade engineer was directing the efforts of four engineer companies, leaving only two companies of the 79th Engineers in the general support role. As the Blue attack neared the river, the two GS companies were returned to battalion control. The battalion, still in the general support role, was tasked to work on obstacles and battle positions along the first phase line east of the river.

In the defense, brigades were generally unwilling to consider obstacle work to their rear. Intensive management of the obstacle effort by supporting engineers was required to effectively employ obstacles behind front line positions. Coordination with brigades became critical as maneuver task forces had to follow fully coordinated withdrawal routes, provide demolition firing parties to execute reserve demolitions, and insure that obstacles emplaced to the rear fit projected tactical plans.

It was found that once maneuver brigades were forced into a retrograde movement, the area assignment became a problem. Engineer units were moving backward but working forward. The entire stratified system of engineer effort tended to collapse on itself as organic engineers moved back into the direct support area. Maneuver task forces, disengaging from the enemy and attempting to set up new positions under fire, could become disorganized or disoriented and run into the pre-set obstacle positions. If organic engineers pick up the responsibilities for reserve demolitions and minefield gaps and lanes, then a complex problem of coordinating obstacle turnover is created.

The Busy Brigade Engineer

Last year, with all engineer battalion headquarters manned and in communication, command and control of individual companies was much better than in 1975. The Brigade Engineer, however, was not able to concentrate on the planning and coordinating of engineer support for the brigade while also coping with demands of command and the execution of plans involving his company. That the system worked at all is attributed directly to the superb efforts of individual company commanders whose initiative met the challenge. In a full-scale war, with much greater demands placed on the brigade engineer and company commanders, the tasking system would not work well for long.

The problem for the Brigade Engineer is that his presence in the brigade command post (CP) is a full-time job in itself. The commander needs his engineer immediately when the situation demands it. Other engineer companies require that the brigade staff engineer be available in the CP for assignments, guidance and direction. Responsiveness by engineers in the brigade sector depends absolutely on the ability of the Brigade Engineer to anticipate the Commander's moves, contribute to planning at conception, influence the Commander's decision and be able to communicate changes in the battle situation to sector engineer units as those changes are directed from the brigade CP.

Who Should Be the Brigade Engineer?

What are the alternatives? Engineer doctrine, past and present, suggests that an ad hoc task force, commanded by a battalion staff officer, be formed when multiple companies overload a brigade sector. However, CARBON EDGE demonstrated that in the extremely fast moving battle anticipated in Europe, creation of such a task force would be difficult. The introduction of a new command and control element in the thick of battle would be most tenuous and of doubtful responsiveness.

A second alternative is the provision of a brigade staff engineer element for each maneuver brigade. A liaison element, staffed by the engineer company executive officer, would improve the current system. However, the CARBON EDGE experience argues that the experience and seniority of a field grade officer are required. The remarkably successful system of the Canadian engineers—with the senior officer always present in the brigade commander's helicopter or command track and his executive officer operating the unit—provides a persuasive example of organizational effectiveness.

A third alternative is to provide an engineer group within the division structure with three small battalions. Such an organization, in line with doctrinal trends of the Division Restructuring Study, would reduce the span of control and maximize the impact of the commander on the battle by providing a dedicated engineer battalion to each brigade. The influence of battalion commanders and staffs would be greatly increased from that experienced during CARBON EDGE.

Finding an Interim Solution

The answer to who should be the Brigade Engineer is a key to improved engineer responsiveness on today's battlefield. The answer requires doctrinal and organizational reassessments and perhaps major change. Until then, interim solutions are required.

In the 3rd Infantry Division, as an outgrowth of CARBON EDGE, small field grade engineer sections have been formed for each maneuver brigade in the field. Drawn from the combined assets of the divisional battalion, three majors are provided as brigade staff engineers, each with two NCOs, transportation and FM communications. Experienced brigade engineers then devote full time during the battle directing engineer efforts in the brigade sectors. The link to the Division Engineer is divisional multi-channel secure radio links.

In garrison, the company commander of the normal engineer company still assists the brigade in the formulation of defense plans and training support, but is free to command his company without managing the engineer effort for the brigade at the same time. The two battalion staffs still support their companies as if they were employed on area assignment.

This concept was tested during a division CPX last November with maneuver commanders expressing overwhelming support. The realities and trade-offs were apparent. It is clear that such an arrangement is possible only where defense plans orient an organization on established terrain prior to conflict. It is just as clear that the departure of the battalion executive officer and S-3 officer would be unwise in a drawn-out conflict.

Conclusion

Engineer responsiveness on the battlefield requires new tools—the UET, mechanized squad vehicles, new breaching and minelaying equipment. But a new doctrinal look at directing engineer operations is also required. Adequate communications and command and control are absolute necessities for battlefield commanders and the engineer commander is no exception. CARBON EDGE was a vivid illustration of the problems engineers face in providing the responsiveness which maneuver commanders need and expect. These problems must be solved, organizationally and doctrinally.

Lieutenant Colonel Paul G. Cerjan was Commander of the 10th Engineer Battalion, 3rd Infantry Division, and Major Fred Gray was Executive Officer of the same unit during REFORGER '77

Combat Engineer

Roles and Missions

Major Terry Farber and Major Fred Gray

CARBON EDGE encompassed all aspects of combat engineering. It was an exercise that should shape and mold engineer doctrine for years to come. This article examines engineer operations of the Orange Force operating well forward as a member of the combined arms team. The perspective is that of the operations section, Orange Forces engineers.

Initially, the engineer effort in support of the Orange Force was controlled using Direct Support (DS)/General Support (GS) concepts. One non-divisional battalion, in DS of the division, received taskings direct from brigade and division engineers. The other Corps engineer battalions operated in GS within the division sector, receiving missions from the 7th Engineer Brigade. The Orange Force Guard Army (OFGA) placed the 3rd Infantry Division into the exercise area of operations. The 3rd Division consisted of the 1st, 2nd, and 3rd Infantry Brigades and the 29th Panzer Brigade. The initial task organization consisted of four brigades on the line with engineer task organization as shown in Figure 4.

Initial Engineer Task Organization

10th Engineer Battalion	Organic to 3rd ID
A Company	DS to 1st Brigade
B Company	DS to 3rd Brigade
C Company	DS to 3rd Brigade
D Company	DS to 2nd Brigade
E Company	GS to 3rd ID, priority 1st Brigade
290th Panzer Pionier Kompanie	Organic to 29th Panzer Brigade
237th Engineer Battalion	DS to Orange Force
A Company	DS to 2nd Brigade
B Company	DS to 1st Brigade
C Company	GS to 3rd Infantry Division
D Company	DS to 29th Brigade
563rd Engineer Battalion (Composite)	GS to OFGA
502nd Engineer Co. (Ribbon Bridge) (-)	GS, aligned with 3rd Brigade
E Co., 16th Engineer Battalion (MAB)	GS, aligned with 2nd Brigade
Plt, 8594th Engineer Co. (Class 60)	GS to OFGA
38th Engineer Co. (Panel Bridge)	GS to OFGA
79th Engineer Battalion (Combat Heavy)	GS to OFGA
275th Engineer Co. (-) (ADM)	GS to OFGA

FIGURE 4

Orange Force operations were divided into two phases. Phase I, the offense, consisted of the second echelon force attack which required the crossing of two major water obstacles—the Iller River and Canal and the Donau River. Phase II, the defense, included defensive obstacle emplacement and retrograde river crossing operations.

Offense—Attack to the Iller River

Offensive operations started 50 kilometers east of the Iller River September 12. The terrain leading westward to the Iller is crossed by numerous small rivers and streams, two of which were not conducive to fording operations. With the exception of major existing highways, most bridges throughout the maneuver area were not capable of supporting tanks. Consequently, maneuver units required the employment of Armored Vehicular Launched Bridges (AVLB) and dry span bridges. The AVLBs in the division armored battalions and the 10th Engineer Battalion, were augmented by six M4T6 dry spans located in a bridge park. Additionally, Bailey Bridge sets from the 38th Engineer Company (Panel Bridge) and one set of German medium girder bridges (MGB) were available.

To expedite bridging operations, four M4T6 dry spans were assembled at the bridge park to be airlifted by helicopter to forward crossing sites. By careful planning and utilization of available assets, the rapid movement of the division to the Iller River was accomplished with only minor delays at the Wertach and Gunz Rivers.

In the 2nd Brigade sector, two M4T6 dry spans and five organic AVLBs were sufficient. In the 3rd Brigade sector, numerous streams and rivers demanded careful management and leapfrogging of limited assets to reach the Iller in a timely manner. In the south, the 29th Panzers were able to move rapidly through their sector to the Iller River without dry span bridging. In the 1st Brigade sector, however, the Wertach River presented a major obstacle. There was no existing bridge of sufficient class to cross an armored battalion. The problem was solved by construction of a Class 60 float bridge by the 237th Engineer Battalion.

The Class 60 bridge, scheduled for removal after

crossing the assault echelons, suddenly became critical with the destruction of four bridges on the main supply route (MSR) to the north. The MSR was routed over the Class 60 bridge and remained in place for four days. Meanwhile, the two companies in direct support of each assault brigade breached, cleared and marked obstacles.

Obstacles were bypassed by maneuver forces where possible. Divisional engineers provided minimum breaching of obstacles to pass assault forces in order to maintain attack momentum. Follow-on companies widened lanes and cleared obstacles. Many bypassed obstacles later hindered the forward movement of Orange float bridging.

Crossing the Iller

The aggressive Orange Forces reached the Iller River sooner than expected, tactical units arriving on the first day. The forward advance slowed considerably as units attempted to secure the far shore. The delay enabled the lagging float bridge units to move forward and link up with the DS engineer companies and maneuver units, thus allowing time to establish river crossing area control groups (crossing area commanders, engineer site commanders, safety officers, etc.).

The Iller River presented a formidable obstacle in itself, but the crossing was further complicated by the requirement to cross a canal which ran immediately parallel to the Iller River. Utilization of all existing bridging was necessary. Allocation of float bridging to the brigades was based on five factors: (1) available water entry sites and river conditions; (2) possible fording sites; (3) the presence of the Iller Canal as an immediate secondary obstacle; (4) types of forces needing to cross the river; and (5) location of the anticipated main attack. Bridging was provided by both divisional and non-divisional bridge units as indicated in Figure 5.

BRIGADE	UNIT	TYPE OF BRIDGE
1st Brigade	E Co, 10th Engr	MAB
	8594th Engr (-)	Class 60 Flt Bdg
2nd Brigade	E Co, 16th Engr	MAB
3rd Brigade	502nd Engr Co (-)	Ribbon Bridge
29th Brigade	8594th Engr Co (-)	Class 60 Flt Bdg

FIGURE 5

The width of the river and the canal, plus the requirement to cross four brigades, made it necessary to employ Class 60 Bridges in two sectors, recognizing that the slow construction time of the Class 60 would normally preclude its use in the assault phase of a river crossing. Although LTR and aluminum foot bridging assets were available, they were not used in the crossing of the Iller or Donau Rivers because numerous locks, dams and footbridges were still intact when the Orange Forces arrived at the river.

The importance to MSR operations of maintaining the Class 60 bridge over the Wertach River cut by half the Class 60 bridging available for the Iller crossing. Available bridge support in the 1st Brigade sector was substantially reduced, permitting only raft operations. By nightfall on the 13th, all brigades were on or near the Iller River and by 2200 hours, both MAB companies and the ribbon bridge platoon were in staging areas ready to enter the river.

The 3rd Brigade forced a crossing with the ribbon bridge and pushed much of its fighting force across the river, but the bridge was damaged by enemy air strikes early on the 14th. The two brigades flanking the 3rd Brigade were not able to cross the river until the evening of the 14th, leaving 3rd Brigade combat elements in a salient position west of the river.

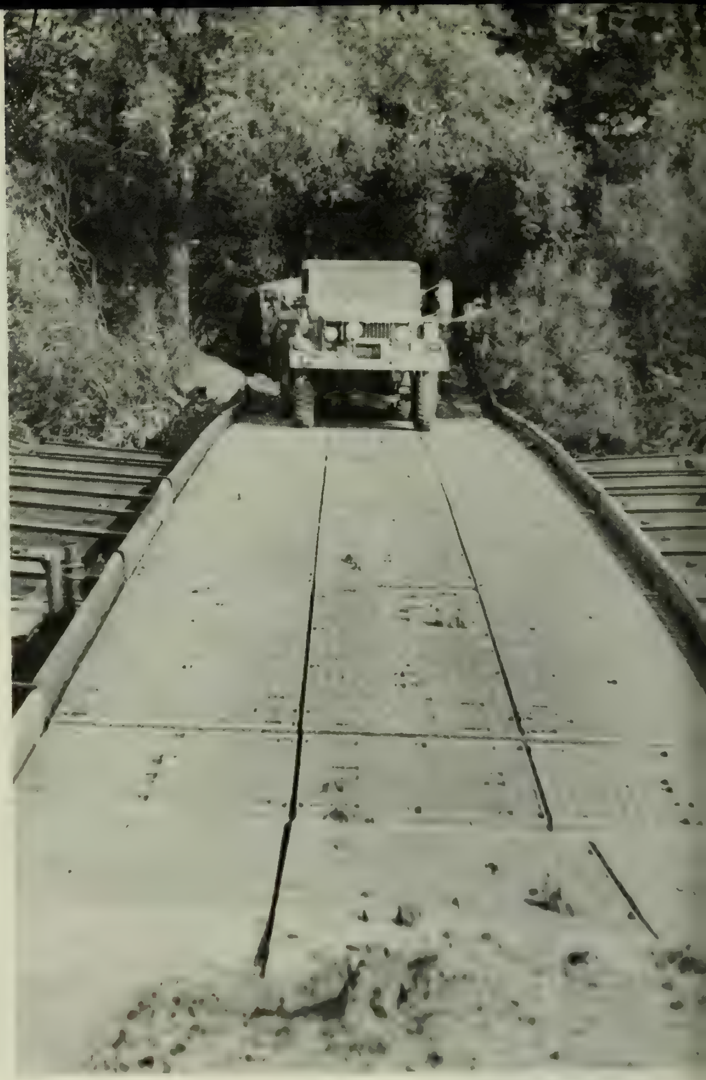
In the 1st Brigade sector, bridging with MAB and rafting with Class 60 commenced about 1700 hours on the 14th. Meanwhile, in the far south, the 29th Brigade was able to ford the Iller River and proceed with little delay. A Class 60 Floating Bridge was placed in the 29th Brigade sector to provide crossing operations in support of the logistical trains.

On to the Donau

Traffic passed over two MAB bridges in the 2nd Brigade sector until one bridge was pulled out late on the 16th to move forward to the Donau. Traffic continued to flow over the repaired ribbon bridge in the 3rd Brigade sector. By midnight on the 16th, the ribbon bridge, MABs of the 10th Engineers, and half of the MABs of the 16th Engineers had been removed from the Iller River to be positioned in support of the Donau River crossing operations.

Bridging remaining on the Iller in support of logistical operations consisted of a Class 60 over the Wertach, a MAB bridge in the 2nd Brigade sector, and one undamaged existing German bridge. An additional route across the Iller canal in the 3rd Brigade sector was opened when the 237th Engineers built a medium girder bridge near the 1st Brigade boundary.

As the attack continued to the Donau, engineers cleared the way by breaching encountered obstacles. Most of the obstacles could be bypassed or cleared with a squad effort. On the morning of the 17th, the 2nd Brigade was able to secure the far shore of the Donau. The other brigades of the 3rd Infantry Division met delayed by stiff resistance and poor terrain and were unable to reach the more westernly Donau in their sectors. Orange Force momentum began to give way on the 17th and came to a halt on the night of the 18th when Blue Forces began a counter-attack.



Orange Defensive Operations

As the defensive phase began, only the 2nd Brigade in the north was across the Donau River and in control of the existing bridges. In the 3rd Brigade sector, two companies of the 10th Engineers unsuccessfully attempted to reach and destroy the existing Donau River bridges. They met fierce opposition and suffered heavy losses.

With the virtual destruction of the two engineer companies in DS of the 3rd Brigade, swift reorganization of engineer assets was directed by the Division Engineer. One company of the 79th Engineer Battalion (Heavy), augmented with heavy earthmoving capability, and one company of the 237th Engineer Battalion was rushed forward to fill the void. The penetration by the Blue Forces caused a rapid weakening of the Orange line. Withdrawal to the Iller was rapid, allowing little time for obstacle emplacement. Defensive obstacle operations by the 237th Engineer Battalion, the 79th Engineer Battalion and a company of the 10th Engineer Battalion were substantial just west of the Iller River. However, Blue Forces concentrated their attack, inflicting great losses on the Orange Force and reached the Iller by noon on the 20th. Orange Forces began to drop the existing bridges on the Iller River, thus insuring that the river served as a major obstacle to the Blue Forces.

During the retrograde movement across the Iller, engineers employed 1st Brigade sector and a MAB in the southern portion of the 1st Brigade sector. Barrier emplacement continued behind the Iller River with three engineer battalions working in relatively narrow strips running parallel to the forward edge of the battle area (FEBA) and between the Iller and the Wertach. From the FEBA rearward, the structure was again established with the organic divisional engineers operating forward, the Corps DS engineer battalion next and the Corps GS engineer battalion further to the east. As the engineers continued to construct a dense system of obstacles on the east side of the Iller, the exercise was terminated.

Summary

CARBON EDGE was an excellent opportunity to exercise engineer doctrine. The problems that arise in control of engineer forces on the battlefield, movement of engineer forces in and out of GS and DS roles, interoperability with allied forces, and coordination with maneuver elements were factors experienced by combat engineers of the Orange Force. Bridging operations revealed insufficient planning by concerned maneuver commanders. Leadership must be aggressive to insure that engineer capabilities are not overlooked on the battlefield. The presence of the brigade engineer in the brigade operations center remains essential to effective integration of operations and timely engineer execution.

Major Terry Farber was the S-3 of the 237th Engineer Battalion (CBT), 7th Engineer Brigade and Major Fredrick Gray was the Executive Officer of the 10th Engineer Battalion (3rd Infantry Division) during REFORGER '77

Engineers stand **tall**

Lieutenant Colonel Theodore Vanderels

One particular mission undertaken by the 9th Engineer Battalion, 7th Engineer Brigade, during CARBON EDGE/REFORGER 77 confirmed combat engineers as essential members of the Army's Combined Arms Team.

The mission occurred during the Blue Force's active defense following a fast-paced 9th Battalion covering operation in support of the 1st Infantry Division east of the Iller River in Southern Bavaria.

Orange Forces launched a strong, two-pronged attack, assaulting the river north of Memmingen and capturing a fixed bridge south of Kempten. The 1st Infantry Division (Main) had just located forward and was still establishing a defensive position with three brigades in on line, north to south. The 2nd Armored Cavalry Regiment protected the deep southern flank. By mid-morning of the second day, Orange Forces had thrust deep into the 2nd Brigade sector. (Figure 1)

The disposition of the 9th Engineers at that time is instructive because several useful techniques of engineer tactical coordination were demonstrated. The 9th was busily engaged during covering force operations emplacing obstacles, erecting a Class 60 Bridge, and controlling two river crossing sites. At the same time, the 9th was physically relocating and changing orientation from Corps Control to direct support of 1st Division (Main) for the active defense. Company B retrieved the Class 60, while Company A was already committed in direct support of the 4th CMBG. Company C, in a general support (GS) role, was constructing two dry spans on an MSR. And D Company prepared for direct support of 2nd Brigade, 1st Infantry Division.

In the early afternoon, the Division Commander ordered 2nd Brigade to contain the Orange thrust. The tactical situation favored the 2nd Brigade because Orange was momentarily overextended and spent by the energetic lunge forward.

The terrain also lent itself to containment by a series of intermediate blocking positions along an arc roughly circumscribing the outer limits of the Orange offensive.

By 2100 hours, Company D had completed reconnaissance, the design of all obstacles, and calculation of munitions required. It then dispersed to begin construction work. Company B arrived and picked up munitions at the forward ASP. They were soon back on the road in six different directions toward individual target locations.

Demolition work and mine laying progressed rapidly, the latter expedited by use of M57 mine layers. Enemy activity, meanwhile, proceeded as expected. Under cover of darkness, Orange units were reinforced and began probing the outer reaches of their positions.

By early the next morning Company D had completed all assigned targets. B Company had completed all but part of one minefield. Before any substantial turnover to tactical units could commence, enemy patrols began exploring the line of contact, some probing security around their targets, one by one, as they judged the threat to be imminent.

Shortly thereafter, as dawn struggled through the dense autumn fog, Orange attacked in force. They were too late. Blue, massed in position between solid barriers of reinforced terrain, held firm. Sensing the success of his defense, the 2nd Brigade commander launched a powerful counterattack that, by controller judgement, destroyed a battalion-size Orange Task Force.

The combined Maneuver-Engineer operation had high visibility at Division Headquarters and a broad effect on the whole defensive posture. Engineers, of course, were especially proud of the achievement. They had reinforced previous training in several valuable techniques. They had been present at the right time and place to accept an unexpected mission. They were mentally prepared to execute the mission despite inconveniences involved in regrouping or relocating. And they were attuned to tactical exigencies so that the urgency of the maneuver concept became a matter of internal motivation.

Lieutenant Colonel Theodore Vanderels was Commander of the 9th Engineer Battalion, 7th Engineer Brigade, during REFORGER '77

Combat **Heavy** support operations

Major Glenn S. Phelps

Exercise CARBON EDGE provided USAREUR and the Engineer Corps with the first full scale field test of the concept, organization and equipment of the Engineer Combat Battalion (Heavy) in support of Combat Arms in the European environment.

The 79th Engineer Combat Battalion (Heavy) is normally assigned to the 18th Engineer Brigade and is actively engaged in construction missions throughout Europe. During CARBON EDGE it was assigned to the 7th Engineer Brigade and operated in general support of the Orange Forces in the 3rd Infantry Division sector.

The 79th fully exploited the forward employment of engineers in the divisional combat areas, which is the current doctrine for employment of the engineer system. The Combat Heavy battalion, with its high concentration of earthmoving equipment and special vehicles, is well suited for survivability and designed for general engineer type missions.

In close coordination with the 10th Engineer Battalion, the 3rd Infantry Division, the 79th moved elements well forward into the brigade combat areas.

Recognizing the problems with communications between elements of the engineer system, the battalion commander of the 79th adopted an area general support concept in coordination with the 7th Brigade commander. This placed two companies behind the division in combat. Each company commander was assigned an area of responsibility and a mission priority list. The third line company was placed along the division main supply route (MSR) for maintenance purposes. Each

company was expected to continuously recon and coordinate with units in each area to identify missions and commit up to 50 percent of resources to combat engineer missions. The remaining 50 percent of each company's capability was on call for general support (GS) missions directed through battalion from division or corps.

During the Orange Force offensive, an assault over a river obstacle was followed by rapid penetrations and exploitations. During the assault to the major river obstacle and the crossing operations, it became necessary to move GS engineer assets forward into brigade combat areas. The battalion headquarters moved into the division rear area to make use of the Divisional Support Command communications capability. It immediately became obvious that communications equipment within the total engineer system was not sufficient for the volume and urgency of traffic generated by engineers within the division area. During CARBON EDGE there were two instead of three Corps battalions and one combat (Heavy) battalion. Yet insufficient organizational communications stood out as the greatest factor limiting the proper application of engineer resources.

By working closely with the Division Engineer and by exploiting the idea of area responsibility, the combat heavy battalion was able to respond effectively to all requirements, including the rapid emplacement of a German medium girder bridge, and the maintenance of a brigade assault route and a vital main supply route. Immediately after Orange forces established bridgeheads over the river obstacle, the combat heavy resources were available to relieve divisional and direct support engineer elements so that they could continue to support the combat elements in their formal assault penetrations.

As Orange forces prepared to defend, the combat heavy engineers were well equipped and organized to support the preparation of barrier and fighting positions.

In order to augment existing engineer assets, the Division Engineer requested and was given two combat heavy companies in direct support. Those units were assigned normal combat engineer missions, as well as special missions such as anti-tank ditch construction and fighting position construction.

The combat heavy configuration is well suited to the preparation of forward defensive positions and also can reorganize as infantry with the strongest battalion fighting force in the engineer system.

Yet during the defensive phase of Orange operations, the friendly and enemy situation was too fluid for proper control of the engineer system with existing communications facilities.

In summary, CARBON EDGE proved the combat heavy engineer battalion organization to be workable and the engineer system of FM 5-100 to be a valuable contribution to the combined arms team. It also provided meaningful field data for TOE review at the DA and USAREUR levels. Finally, the commanders, staff and the soldiers of the 79th Engineer Combat Battalion (Heavy) had the opportunity to exercise in a combat/field environment.

Major Glenn S. Phelps was the S-3 of the 79th Engineer Battalion (Combat-Heavy), 18th Engineer Brigade, during REFORGER '77

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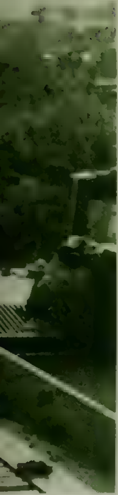

ers Provide
Multiplier
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ms Team

Float Bridging Operations

Major George Smith and Staff Sergeant George R. Paul, II

Successfully executed float bridging operation could play a significant role in winning the first battle of a future European conflict.

Both components of CARBON EDGE, Orange Forces and Blue Forces, were assigned a composite engineer battalion organized to construct four types of bridges—ribbon bridges, Class 60 bridges, Mobile Assault Bridges (MAB) and panel bridges.

Blue Force Bridging Operations

During the Orange Forces attack, the Blue covering force conducted a retrograde crossing of the Iller River, utilizing an 80-meter Class 60 bridge and an 85-meter MAB. Smoke was provided and air defense weapons positioned to protect both bridges. One additional MAB and two ribbon bridges were positioned on the Iller to support withdrawal of the 2nd Armored Cavalry covering force if needed in the north. This gave the withdrawing forces a total of five available bridges in their retrograde across the Iller. The use of the Mobile Assault and ribbon bridges in the retrograde river crossing was sound, but the Class 60 was destroyed in place by the closing Orange Forces after the last friendly vehicle had crossed. The dynamic capabilities provided by MAB and ribbon bridge assets were fully realized. With rapid response time, ribbon assets could be positioned near the river, but not deployed until a need was established,

thus decreasing vulnerability to air and artillery attack. The MAB proved its flexibility—rafting and hiding under river bank cover by day, bridging by night.

When the Blue Force was forced back west to the Donau River, float bridge assets were repositioned to support expected retrograde river crossings. The Commander of the 7th Engineer Brigade directed the 9th and 20th Engineer Battalions to plan and coordinate river crossing operations over the Donau. Three bridges were planned in the northern portion of the Donau, including an 85-meter MAB, a 54-meter ribbon bridge and a 30-meter Class 60 bridge. Only the Class 60 was required and remained in friendly hands as Blue Forces prepared to counterattack.

Bridging dominated the engineer scene as Blue Forces swung to the offensive. Even before the Blue attack, the 20th began emplacing a Class 60 and erecting a 70-foot Bailey Bridge along the MSR behind the Donau. In support of the assault crossing, the 565th positioned Class 60, ribbon and MAB in the northern sector. The Blue counterattack began with the successful seizure of several intact bridges over the Donau River.

Maneuver operations turned dynamically and dramatically when Blue Forces approached the Iller. A detailed crossing plan changed several times in the movement to the Iller. MAB and ribbon assets were positioned well forward and a company of the 9th Battalion was prepared to execute the plan. But considerable confusion resulted when maneuver brigades, designated to make the crossing, were shifted to the north and new crossing area commanders were designated. It proved a frantic, but instructional experience for the combat engineers involved. Airflight of the ribbon bridge to the Iller crossing sites was planned and coordinated with the Corps' Aviation Group. The Iller crossings were not to be made, however. The exercise had run its course and was terminated at that point.

Orange Force Bridging Operations

The Orange 2nd echelon forces needed bridges just to reach their initial line of departure and several of them were accomplished by fixed spans. At Schlingen, a 40-meter Class 60 bridge over the Wertach River was constructed in a little over five and a half hours, just prior to the attack. The 563rd Engineer Battalion was placed in direct support of the 3rd Infantry Division for the Iller River crossings. The initial Orange attack moved rapidly against the outnumbered Blue covering force, leaving MAB and ribbon bridge assets behind. Both elements moved slowly, picking their way around or breaching obstacles bypassed by assaulting mechanized units.

The first Orange bridge, a ribbon, was completed early the next morning and 3rd Brigade maneuver battalions had crossed by daybreak. In the security of darkness, however, smoke and air defense had not been coordinated and shortly after 6 a.m., an air strike knocked out the bridge. Without reinforcements, brigade elements west of the river came under strong pressure from Blue tank forces. But a 5-float ribbon raft was salvaged from assets at the site and crossing resumed by noon. From that point on, only rafts operated during daylight, while the bridge was rebuilt at night.

As Orange Forces swept forward to the Donau River, the float bridges across the Iller were removed and moved forward to support the Donau crossing. Profiting from their earlier experience, engineer and maneuver commanders coordinated closely, resulting in increased responsiveness to maneuver brigade needs.

During Phase III operations (Orange active defense against Blue attack), MAB and ribbon bridging was positioned to rapidly provide retrograde crossings if needed. The 237th Engineer Battalion, supported by the 859th Engineer Company, constructed one Class 60 bridge to support withdrawing Orange Forces.

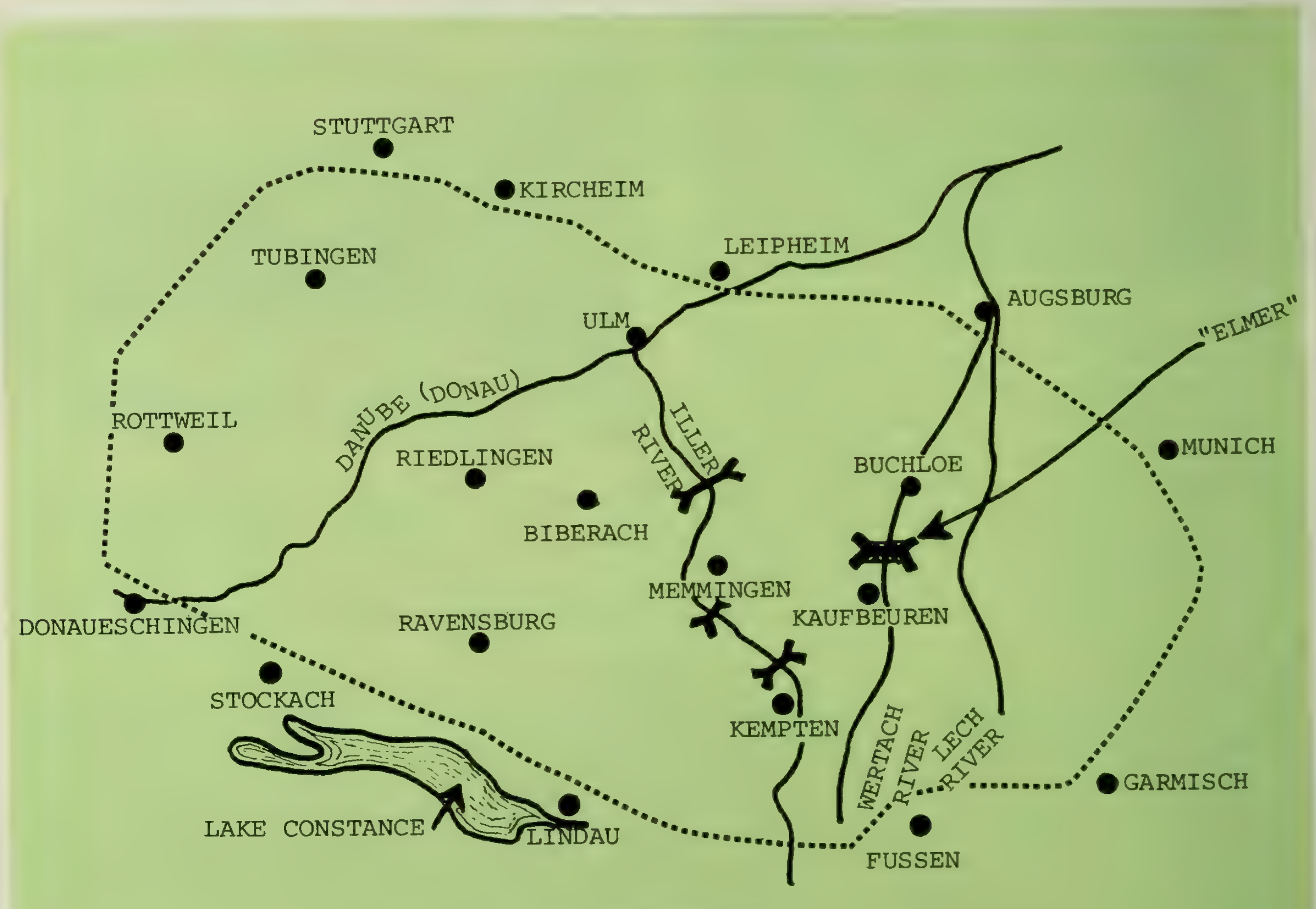

FIGURE 6

Summary

Float bridge employment during CARBON EDGE underscored specific problem areas pertinent to river crossing doctrine. River crossing operations are complex and require timely, detailed, scheme of maneuver. During CARBON EDGE, river crossing operations were often not given timely planning priority by maneuver commanders. Engineer initiative to provide the advance planning carried the day in many cases. In others, faulty coordination resulted in unprotected bridging. The lesson was reiterated—river crossings need to be planned at division level, whether or not execution is decentralized to brigade level. The tough decisions on allocation of scarce bridging assets must be made at division level. At that point, the commander can influence the battle by reinforcing success or cutting losses.

The composite bridge battalion staff proved to be an essential element in controlling Corps brigade elements, greatly increasing the effectiveness of bridge planning and coordination. The commander and staff can also provide additional planning capability to assist divisional river crossings. The exercise demonstrated that the current organization of the composite battalion headquarters is insufficient and its communications capability inadequate to support combat operations over the frontages of the modern battlefield. AM equipment in each float bridge company was found to be an absolute requirement.

Assault float bridging appeared to be more responsive in the Orange Forces and was positioned well forward in each brigade sector. Of course, positioning depends on the availability of sufficient assets. Responsiveness and flexibility are provided by the ribbon bridge capability of being transported and inserted by helicopter. Such an air-lift exercise was conducted by the 565th Engineer Battalion using Corps aviation elements. The air-lift exercise demonstrated that ribbon bridges can be airlifted with much less planning and time than the M4T6 or Class 60. Transporting the ribbon bridge by air allows rapid employment without a buildup of vehicles at the crossing area which could signal intentions to enemy forces. Most important is the flexibility retained by the commander. With rigged, ready-to-go ribbon bays and standby aviation, he can quickly move to the location of any one of several assault crossings.

Exercise CARBON EDGE/REFORGER 77 demonstrated better than any previous exercise the importance of float bridge operations in winning the first battle. The VII Corps organization of assigning all nondivisional float bridge assets to a single battalion proved to be tactically sound. Above all, the ribbon bridge demonstrated its responsiveness and versatility—and its value to the Corps combined arms team.

Major George F. Smith was the Executive Officer and Staff Sergeant George R. Paul was the S-3 Plans NCO of the 565th Engineer Battalion, 7th Engineer Brigade, during REFORGER '77

A Bailey Bridge called "Elmer"

Second Lieutenant Mark C. Nelson and
Second Lieutenant Robert F. Slockbower

Employment of the Bailey Bridge proved to be one of the most challenging operations for Combat Engineers during CARBON EDGE.

Soon after the Orange Forces launched their initial attack, the Blue fighter-bombers destroyed the 3rd Infantry Division's main supply route over the Wertach River. Rather than employing the assault bridges that were critically needed at the front some 40 kilometers away, the 3rd Infantry Division (Mech) requested engineer general support from Corps. B Company, 79th Engineer Battalion (Combat Heavy), was tasked to build a Bailey Bridge. The 38th Engineer Company (Panel Bridge), part of the 563rd Engineer Battalion (Composite), supplied bridge assets and provided technical expertise necessary to construct the bridge.

Preparation for construction began immediately. Surveyors and reconnaissance teams worked throughout the night to select the best site. By noon the next day a site near Turkheim was selected which required a single span of double-truss triple story bridge, 45 meters long. The operation, code-named "Elmer", presented quite a challenge since a single span bridge of such size had not been attempted in Germany for many years. Not a single person assigned to either B Company of the 79th, or the 38th had any experience in constructing a bridge so large.

While reconnaissance of the site was being conducted, both engineer units were moving into action. B Company, 79th moved forward to establish a bivouac near the bridge site and immediately began site preparation. The near shore was three meters higher than the far shore, an inconsistency which had to be corrected. Over 550 cubic meters of earth were removed from the near shore, and approximately 150 cubic meters of aggregate were hauled in and compacted to build up the far shore. Surveyors from the 79th Engineer Battalion were used to control the cut and fill operations, lay out the bridge center-line, and position and level the rollers.

Engineers of the 38th Company located one platoon of 22 five-ton dump trucks to a bivouac site near the bridge park where Bailey Bridge sets were prestocked. These two bridge sets and the one bridge set organic to the 38th were used to construct this massive bridge. For the next three days a steady stream of five-ton dump trucks convoyed Bailey Bridge components from the Orange bridge park to the bridge site.

Crews from the 79th and the 38th worked around the clock for three days hauling bridge parts to the site and constructing it in place. Finally, the bridge was ready to be launched across the Wertach River. A D7F dozer was used to push all 108 tons of "Elmer" across the gap. Once across, eight bridge jacks were used to jack down each end of this massive bridge onto its permanent supports. When the ramps were subsequently positioned a critical MSR had been reopened.

"Elmer" provided a challenge that had not been met by Army Engineers in Europe for many years. Normally, training involves construction of smaller bridges—double-single at the most. But the engineers of the 79th Engineer Battalion and the 38th Panel Bridge Company demonstrated they could meet the challenge of an unexpected and tough mission.

Lieutenants Mark Nelson and Robert Slockbower were assigned to the 38th Engineer Company (Panel Bridge), 563rd Engineer Battalion, 7th Engineer Brigade, during REFORGER '77

An Umpire's Perspective

First Lieutenant Gary R. Myers

It is said that, during a recent REFORGER exercise in West Germany, a German farmer was heading home from the fields after a hard day's work when he approached two soldiers standing near a bridge. As the farmer neared the bridge, one soldier motioned him to stop and reported that he could not proceed because the bridge had been "blown up". The farmer, who spoke little English, was a bit confused as the bridge appeared to be (and, in fact, was) intact. He asked the soldier if he had understood him properly and the young private replied that the bridge was destroyed by some engineers several hours earlier. The farmer, exasperated, finally asked the second soldier for help. The second soldier replied "I'm sorry, I'd like to, but I've been dead for two hours!"

Simulation has always been a problem during large scale exercises. Lacking are thousands of bits of information that unit commanders need to effectively employ their units. There are no incoming rounds to sound an alarm, no weapons signatures to locate enemy units, no road craters to stop tanks, no minefields to stumble into. Without such inputs, units may as well be taking part in a one-sided rehearsal. Commanders don't have to **react**—and don't learn very much.

To fill this gap—to provide the information that might reasonably be expected to be available during an actual conflict—is the role of umpires and the umpiring system.

Accompanying the 40,000+ soldiers that participated as players in Exercise "Carbon Edge" were approximately 2,400 umpires and control personnel. Two hundred of these umpires were engineers from the 16th Engineer Battalion, 1st Armored Division, and almost every non-playing engineer unit in Europe. They were armed with an entirely new umpiring system, combining the best features of previously used systems and several new concepts conceived at HQ USAREUR and refined into actual procedures by 1st Armored Division's Umpire Planning Group.

The biggest single improvement over umpiring procedures used in previous years was the use of Area Coordination Centers (ACC). The exercise area was divided into thirteen sections after an extensive map reconnaissance and communications exercise. During CARBON EDGE, an ACC occupied a prominent hilltop in each sector. Each ACC was comprised of maneuver, fire support, and obstacle sections whose responsibility was to assist unit umpires by receiving, transmitting or providing information on exercise operations.

TYPICAL ENGINEER COMPANY UMPIRE PACKET

Personnel	Equipment
1—Captain	1—¼T Truck w/AN/VRC-47 Radio
2—Lieutenants	2—¼T Truck w/AN/VRC-46 Radio
3—Drivers	1—RC-292 Antennae

FIGURE 7

For example, ACC maneuver sections informed unit umpires of the call signs and frequencies of the opposing forces umpires so that direct coordination could be made. Obstacle sections received information on river crossings, obstacle emplacements, executions, and breaches and passed it on to the umpires of maneuver and engineer units who would be affected so that they could be in the right place at the right time. ACC obstacle sections determined where obstacle guards would be employed to assist in control of simulated obstacles and also coordinated directly with the obstacle guard companies.

Engineer units were provided with umpire packets. The personnel and equipment of a typical engineer company umpire packet are shown in Figure 1. Umpires provided the interface between ACCs and engineer player units. They also kept players "honest" by validating operations that had to be simulated—mainly barrier material haul, obstacle emplacement and execution, and some bridging operations. In addition, they assessed losses if the engineer units came into contact with opposing maneuver units, as they often did.

Despite the flow of obstacle information to both engineer and maneuver umpires, problems with control of obstacles were anticipated. To assist in control of obstacles, thereby forcing maneuver units to both see the effects of obstacles used to support their defenses and to react to them on the offense, 130 barrier guard teams were provided by the 1st Battalion, 52d Infantry (Mech). The two-man teams, armed with flashlights and reflective vests, were stationed at selected obstacles (sometimes for several days) and signaled approaching player units to stop at the simulated obstacles. Once the lead vehicles were stopped, unit umpires could take over and insure that the unit took appropriate actions.

REFORGER 77 has been lauded as an outstanding exercise. Much of the credit for this success goes to those ACC personnel, unit umpires, and enthusiastic, if sometimes misguided, barrier guards.

(By the way, it's rumored that the farmer got home by crossing a nearby (simulated) ribbon bridge.)

1st Lieutenant Gary R. Myers was assigned to the 16th Engineer Battalion, 1st Armored Division and attached to the 1st Armored Division Planning Staff during REFORGER '77.

In Retrospect

Lessons Learned

Colonel Richard S. Kem

Today's battlefield is huge, lethal and dynamic. An 85-kilometer, four-brigade division front is difficult to appreciate until it has been experienced. Separation of units puts a premium on intelligence, knowledge of the battlefield and terrain reinforcement—especially linear obstacles that canalize tank formations, delay tank movement and permit economy of force operations.

The bottom line of the engineer experience during exercise CARBON EDGE is that the modern battlefield absolutely requires a quantum improvement in combat engineer responsiveness. The tools of the combat engineer and some of his doctrine are showing age—improvements are needed now.

Terrain Reinforcement

One of the major lessons learned from CARBON EDGE was the significant impact of terrain reinforcement as a combat multiplier. From his vantage point, the Corps Commander, LTG David E. Ott, observed that the comparative mobility of Blue and Orange Forces during the attack were greatly shaped by the defenders' use of terrain and terrain reinforcement.

A prime example was the highly effective firetrap developed by the 1st Infantry Division near Fellheim. On the other hand, there appeared to be a tendency on the part of many maneuver commanders to defer obstacle planning to the engineers. Consequently, obstacles

were not planned, coordinated and executed effectively in many brigade and battalion sectors—at a cost in combat capability.

As expected, obstacle material logistics became a significant problem during CARBON EDGE. Over 600 tons of Class IV and V materials were required daily to support division obstacle plans. The 3rd Infantry Division skillfully solved the problem by establishing a barrier operations center under the divisional engineer battalion executive officer who coordinated the forward movement of these critical assets.

Coordination problems involving obstacle execution prevailed on both sides. Bridges were lost, targets were executed too soon and others were never executed. Target turnover is the key to an active defense and CARBON EDGE clearly illustrated the need to carefully orchestrate target execution.

Engineer Capability Requirements

CARBON EDGE demonstrated that the rapid pace of modern combat demands flexible and responsive mine and countermine systems. This is particularly true in light of the great impact terrain reinforcement had on relative combat power.

With the wide frontages on the CARBON EDGE battlefield, linear obstacles were required in considerable numbers. The M57 minelayer was used extensively, but was not fully responsive to changing tactical requirements. The M56 system, used by Blue Forces, was a dynamic new addition to VII Corps, and was effectively used to close gaps and lanes in the face of an advancing enemy. The quantum improvement in responsiveness by the M56 indicates that other dynamic minelaying systems are urgently needed today to provide engineers with the ability to responsively support the maneuver commander.

During offensive operations, engineers were widely employed in breaching operations. The breaching tools available were woefully inadequate—the mine detector and bayonet remain basic tools of the trade. CARBON EDGE clearly demonstrated the need for modern, responsive countermine systems.

Once again, the exercise demonstrated that cratering can temporarily halt enemy armor advances. Deliberate and hasty crater construction by the current two-step method was too slow and unresponsive. The fast-moving active defense experienced during CARBON EDGE highlighted the urgent need for a rapid cratering system—such as the M180 system.

Engineer Mobility

CARBON EDGE also clearly demonstrated the requirement for mechanization of Corps engineer battalions. Wheeled engineer units lacked the mobility, firepower and survivability required to adequately operate in direct support of mechanized forces throughout the exercise. Direct support Corps engineers habitually operated well forward, near the line of contact, and alongside division engineers. Because of the cross-country mobility differential, Corps engineer units were not able to keep up with supported mechanized units. Engineers also need the additional firepower and protection provided by mechanized fighting vehicles when employed in their secondary role as infantry.

The lack of mobility of engineer equipment was dramatically demonstrated. The tractor lowbed transportable dozer was not sufficiently mobile to be responsive to the needs of maneuver commanders. Many engineer commanders left D7 tractors/lowbeds in the rear because of their vulnerability. The universal engineer tractor (UET), which can dig fighting positions and anti-tank ditches and has a mobility comparable to supported mechanized forces, is urgently needed. It will give engineers committed to the forward battle area a greatly increased capability for responsiveness.

Tactical Bridging

Considerable tactical bridging was required during CARBON EDGE. Deployed Armored Vehicular Launched Bridges (AVLB) were replaced by short M4T6 and dryspans and moved forward with assault forces. The ribbon bridge fully demonstrated its battlefield flexibility. Mobile Assault Bridges (MAB) and ribbon bridges were displaced forward to the next assault crossing as GS engineers constructed follow-on Class 60 bridges for logistical elements of the divisions.

The engineer Line of Communication (LOC) maintenance mission has changed dramatically. It no longer is mere road construction, but now includes the replacement and repair of bridges destroyed along LOC's. Interdiction missions, often requiring large Bailey Bridges, emphasized the need for engineers to maintain such skills. The considerable time required to construct large Bailey Bridges illustrated the need to move the Medium Girder Bridge (MGB) to Europe as soon as possible. It should be noted the two largest Bailey's constructed, 150′ DT and 160′ DS, fit the planned 160′ MGB set with reinforcing kit. Further, the many requirements for LOC bridges indicates that we may well have underestimated fixed bridging requirements throughout the battlefield. Therefore, bridge stocks and positioning need to be reviewed and revised where necessary. Storage should not be done by components but in ready-to-use configuration in order to reduce loading and movement times.

River crossing operations revealed a continuing need to train maneuver forces in this complicated maneuver. The construction of the bridge is the simple part of the operation. With the rapid turnover of personnel, coordination of all assets makes the operation complex. Planning, coordination and execution provide a real challenge in a free-play contested exercise. CARBON EDGE emphasized the need for river crossings to be planned and orchestrated at division whether or not the execution is decentralized to brigade level.

Communications, Command and Control

CARBON EDGE demonstrated again and again the problem of controlling engineer assets spread the length and width of the battlefield. To accomplish required command and control, reliable long-range communications with organic companies, non-divisional engineer units, and the division and brigade staffs are essential. The current organizations of FM radios provide a tenuous and inadequate communications link. More reliable systems, both secure and nonsecure, are required.

The provision of a multi-channel radio terminal is

essential for effective coordination of engineer efforts. The engineer battalion command net should be AM, with FM backup, to permit reliable, secure communications with dispersed engineer companies across the division sector. Additional radio, telephone and teletype (RTT) capabilities are needed to permit communications with non-divisional engineers in the division and Corps rear areas. Only by greatly upgrading the communications capabilities of engineers and insuring the battlefield availability of existing multi-channel systems to engineer units can the necessary control and coordination of engineer assets be assured.

The Brigade Engineer

The CARBON EDGE experience demonstrated the need for an individual at maneuver brigade level who can devote full attention to controlling and coordinating engineer assets in the brigade sector. The doctrinal methods of controlling assets do not provide a solution to the control and coordination problems experienced. A full-time brigade engineer is essential if planning is to be timely and engineer operations are to be responsive. A field capability and assistance is the optimum solution.

The Division Restructuring Study (DRS)

Several lessons learned are applicable to the restructured division. The importance of linear obstacles on the modern battlefield, such as minefields and antitank ditches, was reinforced by exercise play. As designed, and when fully equipped, the restructured division engineer battalion would provide greater capability in this important area.

The current divisional engineer battalion does not contain sufficient assets to adequately support three brigades online. Corps engineer companies therefore habitually operated alongside divisional engineer companies near the line of contact. The DRS concept of corps engineer companies operating to the rear of division engineer units, is not in keeping with the realities of the wide frontages experienced during CARBON EDGE. Direct support battalions are involved primarily in mobility-countermobility tasks, not general engineering.

As described, CARBON EDGE highlighted the problems of the brigade engineer. DRS will expand the commander/brigade engineer's control from three to six platoons, asking too much of an already burdened commander. A full-time engineer at brigade is required to integrate engineer support in all aspects of tactical operations.

Flexibility and the Engineer Leader

A salient lesson for Corps units on REFORGER 77 was the underlying need to be continuously flexible.

Battalion staffs found themselves readjusting frequently from general support (GS) of Corps and Division, to direct support of Brigade. These shifts translated into major reorientations at the company level.

Flexibility is an expensive commodity. It requires a special discipline of mind. It requires well-practiced techniques of command and control that can absorb unexpected and urgent tasks. And it demands extra coordination, both laterally among engineers and vertically to supported elements of the combined arms team. One engineer company commander put it this way at the end of REFORGER: "I know of no place where it is written, but an engineer commander must be able to anticipate the needs of his tactical commander. He must be ready to create obstacles where the old man would want them. And he can do this only by knowing the mind of his commander, his style of fighting, and the weapons he fights with. He must be so capable and have confidence to know that should the maneuver commander suddenly disappear, he could assume command and fight a successful engagement".

Colonel Richard S. Kem was the Commander of the 7th Engineer Brigade, VII Corps, during REFORGER '77

Officer career info

Lieutenant Colonels

Often, when talking with officers about future assignments, the discussion comes to the question of just where Engineer lieutenant colonels are assigned. The figures in the chart below may help you in thinking about your future assignments.

First, though, a caveat or two. The numbers are from a "quick count" and may not include officers currently on orders. Therefore, the numbers may not precisely agree with the number of officers actually at a location. Also, a few officers may be counted twice. For example, some CONUS battalion commanders and DFAEs are included in the TRADOC figures and some in the FORSCOM figures. Still, the information may be useful.

Command/Location	**No. Engineer LTCs**
TRADOC (including 20 officers in ROTC PMS positions)	71
FORSCOM (including 54 officers in Reserve Components duty)	115
USAREUR	70
Joint HQS in Europe	21
Korea	12
Hawaii	13
Other Overseas	12
Senior Service School	20
OCE (including Saudi with 12 and CONUS districts with about 50. Remainder in Washington area)	113
DA staff/agencies in Washington area	90
Battalion Commanders:	
CONUS	40
Europe	20
Korea	3
Hawaii	3
DFAEs:	
CONUS	25
Overseas	23

Majors

Congratulations to those captains newly selected for promotion to Major AUS. Your files are now managed in the Majors Division, Officer Personnel Management Directorate. It's great to have you!

Assignments

Thirty-six months stability of assignments continues to be the rule, but Army requirements are still the over-riding factor. Accordingly, breaks in stability will occur. Meeting requirements, professional development, overseas tour equity, and personal preferences are all considered in making assignments, but compatibility of all four factors may not always be possible.

Captains and Lieutenants

Preference Statements (DA Form 483) provide the opportunity to express your assignment and duty preferences. You can submit one at any time you desire to change your preferences (except for officers who have submitted a personal request for a CONUS terminal assignment of choice). You should, at a **minimum,** submit a preference statement:

(1) approximately nine months prior to completion of an overseas tour or stabilized tour within CONUS;

(2) approximately one year after reporting to a CONUS station on a non-stabilized tour;

(3) within 60 days after beginning a course of instruction at a CONUS PCS service school, civilian institution, or in private industry;

(4) approximately one year after beginning an initial graduate degree utilization tour.

Warrant Officers

Selection Boards. Two selection boards of interest to warrant officers and their commanders will convene at HQDA as follows:

—25 July 78: **Regular Army Selection Board.** This board inaugurates the RA "decision point" process for warrant officers. Details of the program and individuals in the zone of consideration are given in DA Circular 601-80, dated 15 May 78.

—12 Sep 78: **Warrant Officer Senior Course Selection Board.** This board will select students to attend the Warrant Officer Senior Course in FY 80. Personnel in the zone of consideration are listed in DA Circular 351-80.

MOS Revision. The utilities operation and maintenance specialty (MOS 310A) has been approved by HQDA for modifications recommended by the U.S. Army Facilities Engineering Support Agency. Specifically affected are the functions of the subspecialty represented by Special Qualification Identifier (SQI) "5." Award of this SQI will create for the individual an additional MOS that carries the title of the SQI, i.e., MOS 310A5-Power Systems Technician. Announcement of this revision was made to MACOMs for planning purposes by HQDA Letter, DAPC-MSP-00, subject: Change to AR 611-112, Manual of Warrant Officer Military Occupational Specialties, dated 20 Apr 78. Details will appear in Change 1 to AR 611-112, which has been submitted for publication.

Procurement and Accession. The FY 79 warrant officer procurement program will be announced in DA Circular 601-81, which will be distributed in the July-August time frame. This circular will announce anticipated vacancies, qualification criteria and application procedures. Personnel interested in applying for appointment or in recommending others for WO appointment should make a note to consult this circular when it becomes available.

Service Obligations

All officers should be aware of the obligations incurred as a result of permanent change of station (PCS) moves and advanced course attendance. AR 635-120, paragraph 3-1c(1) which deals with Unqualified Resignation, states that "Officers who have departed the continental United States will normally be required to complete the current prescribed tour for the area of assignment as specified in AR 614-30. All others who receive a permanent change of station will be required to serve one year at their new duty station." AR 635-100 reinforces this.

Attendance at the Advanced Course obligates an officer for one year from the date of course completion or termination of attendance thereat, whichever is earlier. Further information on school obligation can be found in AR 350-100. Service obligations are sometimes additive. Therefore, individual officers should contact their respective assignment officers for information on total incurred service obligation.

Engineer Personnel OPMD Contacts:

- Colonels Division (DAPC-OPC-AE)
  Engineer Assignments, LTC Lin Lufkin, x 7871
- Lieutenant Colonels Division (DAPC-OPL-AS)
  Engineer Assignments, LTC Thomas Fisher, x 0423
- Majors Division (DAPC-OPM-A)
  Engineer Assignments, MAJ Wayne Roth, x 8109
- Combat Support Arms Division (DAPC-OPF-E) (Company Grade)
  Engineer Branch Chief, LTC Norman Kuklinski, x 0650
  CPT Assignments, MAJ Mike Foster, x 0651
  Lieutenant Assignments, CPT Matt Dominy, x 7434
- Warrant Officers Division (DAPC-OPW-AU)
  Engineer Assignments, CW3 Aleck Fletcher, x 7837

NOTE: Commercial telephone line: Listed numbers preceded by Area Code 202-325-. Autovon line: Listed number preceded by 221. If you cannot call, please write the following address: Commander, US Army Military Personnel Center, ATTN: (appropriate office symbol), 200 Stovall Street, Alexandria, Virginia 22332.

Professional Development

Professional development of company grade officers is a unique challenge in today's Army. Optimum professional development involves the individual officer, the chain of command, and personnel managers at MILPERCEN's Officer Personnel Management Directorate (OPMD).

In accordance with today's stabilization guidelines, longer tour lengths are the rule. Consequently, younger officers may face decreased opportunities for development, thus adding greater emphasis to the commander's role in their development.

There are many competing demands on the company grade officer—military and civilian education plus duty in a primary specialty and eventually duty in an alternate specialty. MILPERCEN attempts to balance assignments with other aspects of professional development in meeting the Army's needs. The main objective in meeting those needs is to qualify each company grade officer in his primary specialty.

Duty with troops and command at the company grade level are important professional development factors in many OPMS specialties. Selection of officers for troop duty and company command is controlled by field commanders. The commander makes the ultimate assignment and supervises the performance of officers assigned to his unit. Thus, commanders are key players in the development of their assigned officers. It becomes increasingly important for commanders to support and assist MILPERCEN in the development of the officer corps. A professional development team consisting of MILPERCEN and the commander must combine to give each company grade officer advice and counsel that will enhance career development and progression.

The new DA Pamphlet 600-3, Officer Professional Development and Utilization, dated September 1977, has been distributed to the field. The new version has been simplified and is a convenient tool for the individual officer and his commander to use for career planning under OPMS.

Microfiche Official Military Personnel File (OMPF)

Policy change allows MILPERCEN to furnish future copies of Microfiche OMPF at no charge if total is less than $30. The change **does not** affect the fee schedule for purchase of your paper file. Requests should be sent to DAPC-PSR-S, 200 Stovall Street, Alexandria, Virginia, 22332.

Requests for correction of microfiche OMPF must be forwarded through supporting MILPO. Individual requests sent directly to MILPERCEN without screen by the MILPO are being returned for processing by the MILPO.

MILPERCEN receives many requests to add documents not authorized for filing in the OMPF in accordance with AR 640-10. Examples of items not authorized are Letters of Appreciation/Commendation where individual is not identified by name in the basic document; and subcourse completion documents. Orders for badges, tabs and unit awards are not filed in the OMPF but appear on the Officer Record Brief (ORB).

Education/Training Review

A DA study group headed by Major General Benjamin L. Harrison is scheduled soon to brief the Army's Chief of Staff on the results of its review of officer education and training. It is the first major review of officer education and training since 1965. The official title of the study group is the Review of Education and Training for Officers (RETO) Board.

RETO's mission is to determine training and education requirements based on Army missions and individual career development needs. It is also surveying programs in the other services, private industry, universities, and foreign armies for ideas that may lead to innovative solutions to problems identified in the review.

Enlisted career info

Engineer SQTs

A new milestone schedule has been adopted for the start of Skill Qualification Testing of Engineer soldiers. The new schedule, developed by the Individual Training Analysis and Design Division, Directorate of Training Developments, USAES, programs the starting dates for SQTs by MOS and skill level on a monthly basis.

Previously, SQT starting dates were scheduled by Career Management Field on a quarterly basis. The new schedule will not result in soldiers being tested earlier than the dates previously announced. An updated schedule, along with other information on the Enlisted Personnel Management System (EPMS), will be published in the next issue of THE ENGINEER.

Reenlistment Restrictions

First term male soldiers holding certain primary Military Occupational Specialties, including 62J (General Construction Machine Operator), 81B (Construction Draftsman) and 81E (Illustrator), may be denied reenlistment in those MOSs if they entered the Army between October 1973 and September 1975. The restrictions apply only to reenlistments through 30 September of this year, but may be extended beyond that date.

The restrictions are considered necessary by DA because strength projections show that these MOSs, among others, will be over-strength by the end of the current fiscal year if curbs are not imposed.

DA officials state that similar restrictions were placed on women soldiers in the same MOSs about a year ago.

The new policy requires first-term male soldiers who wish to reenlist in one of these MOSs to choose three alternate, shortage MOSs for reenlistment should they be denied reenlistment in their current primary MOSs.

Applicants may also include statements, either from themselves or their commanders, citing reasons why they should remain in their primary MOSs.

Reenlistment Bonuses

Recent additions to the Selective Reenlistment Bonus (SRB) rolls are two Engineer Military Occupational Specialties (MOS). Effective April 17, 62E (Crawler Tractor Operator) and 62F (Crane Operator) were awarded SRB multipliers of 2A.

Other Engineer specialties that qualify for reenlistment bonuses in Zone A include: 12B (Combat Engineer), 12C (Bridge Crewman), 12E (Atomic Demolition Munitions Specialist), 52C (Power Pack Specialist), 52D (Power Generator Equipment Repairman), 62B (Construction Equipment Repairman), and 82D (Topographic Surveyor). The 52C and 52D specialties also qualify in Zone B.

For personnel to qualify for an SRB in Zone A, time-in-service must be 21 months to six years at the time of reenlistment. To qualify for an SRB in Zone B, personnel must have time-in-service of six years and one day to 10 years at the time of reenlistment.

The current maximum SRB remains $12,000.

MOS Switches

The new Bonus Extension Retraining (BEAR) program that is being tested in 12 MOSs will allow soldiers to change jobs and still draw reenlistment bonuses.

Under the new program, soldiers reenlisting for a second or third term may leave an overstrength MOS and train for one of 12 shortage MOSs. After training, soldiers will be awarded bonuses in MOSs for which they reenlist.

Qualification for the program is basically the same as any other reenlistment qualification, but several policy waivers permit applicants a degree of flexibility. In addition, BEAR participants are eligible to receive training between PCS assignments, or they may receive training and then return to their present CONUS installation, subject to local job openings.

Seven MOSs in the BEAR program are open to soldiers with 21 months to six years of service at the time of reenlistment. The seven are 12E, 15E, 16C, 16D, 16P, 24C, and 24M.

MOSs open to soldiers with 21 months to 10 years service at reenlistment are 54E and 63E.

MOSs open to soldiers with six years to 10 years of service at reenlistment include 21G, 24G, and 24K.

The Bear program is expected to continue as long as soldiers show an interest in it. Job descriptions in the shortage MOSs and additional information on the program are available through local reenlistment offices.

Appeal Correspondence

A new procedure for filing denied appeals of enlisted evaluation reports (EERs/SEERs) and academic evaluation reports (AERs) became effective May 1.

Denied appeal correspondence from individuals is no longer filed on the performance fiche of the official military personnel file (OMPF). It is now filed on the restricted fiche. The decision to eliminate denied appeal correspondence is based largely on surveys of recent selection/promotion boards and their after-action report comments.

Previously, the OMPF contained only two sub-sections—the performance fiche and the service fiche. A third sub-section—the restricted fiche—has been added. The added portion will NOT be provided to promotion/selection boards or career managers. This protected file contains those documents which must be permanently retained to facilitate personnel administration and/or to protect the interest of the government and the individual.

Although the new procedure is not retroactive, individuals may request to have previously denied appeal correspondence transferred from the performance fiche to the restricted fiche. Requests will be considered on a case-by-case basis and should be directed to: Commander, USAEREC, ATTN: PCRE-RP-A, Fort Benjamin Harrison, IN 46249.

Tardy Reports

The Army-wide late submission rate for enlisted evaluation reports (EERs/SEERs) is a whopping 33 percent, according to the latest MILPERCEN review.

Selection boards and personnel managers must have accurate and timely information to make decisions concerning promotions, assignments, retention on active duty, and military schooling. The importance of the EER/SEER to the soldier and the Army necessitates a much better effort on the part of all concerned.

Among the most common administrative errors noted on EERs/SEERs are the following: the rating period begins and ends with the same month; soldiers are rated by other soldiers of the same grade; unauthorized individuals are signing reports "for" rating officials; narrative comments do not support rating; and description of duties is omitted.

Rating officials are reminded that familiarity with Chapter 8, AR 600-200 is the key to improvement in the quality of EERs/SEERs.

CSM Assignments

Priority assignment of command sergeants major to TOE battalions on the basis of branch qualification began earlier this year.

The new policy means that in order for a CSM to be assigned to a TOE engineer battalion, he must be qualified in either CMF 12 (Combat Engineer), CMF 51 (Combat Heavy), or CMF 81 (Topographic Engineer).

Command sergeant major assignments to non-TOE organizations will also be made on the basis of branch qualification, depending on the availability of qualified NCOs. But because the assignment of CMF-qualified senior NCOs to CSM positions in TOE battalions has a higher priority, a higher percentage of TDA battalion command sergeant major positions will be filled by NCOs who do not have a background in a related career field.

Full implementation of the new CSM assignment policy is expected to take about three years by allowing for phased reassignments within normal tour-completion and PCS constraints. In the meantime, commanders are not expected to reassign CSMs within their command solely to comply with the new policy.

To insure that there will be enough branch-qualified CSMs to fill all TOE battalion CSM positions, future selection boards will operate under a "two cut" concept. In other words, if initial selections do not include the required number of NCOs by career fields, the board will then be asked to select specified quotas to meet branch-related requirements.

Selected senior NCOs from the second cut must be fully qualified to assume CSM duties and will be placed on the selection list with the NCOs selected in the first cut. The additional selections are not expected to increase significantly the total number of CSMs.

Warrant Officer Vacancies

The Army is now accepting applications to fill about 1,250 warrant officer vacancies, including positions as Survey Technician (821A) and Engineer Equipment Repair Technician (621A). The competitive selection process is open to members of all services.

The opening date for submission of applications for Survey Technician was July 1, 1978, while applications for Engineer Equipment Repair Technician have been accepted since October 1, 1977. The closing date for submission of applications for both positions is September 30, 1978.

Mandatory prerequisites exist for both positions. To apply for Survey Technician, you must have completed Course 412-82E20, Geodetic Computing, and Course 412-82D20, Geodetic Surveying. To apply for Engineer Equipment Repair Technician, you must have completed either Course 612-62B10, Engineer Equipment Mechanic, or Course 612-62B20, Engineer Equipment Repairman.

Other details, including preferred qualifications for appointment to warrant officer status, are listed in DA Circular 601-73 and AR 611-112.

CSM Retention

A DA selection board convened at Fort Benjamin Harrison, IN, on June 14 to consider command sergeants major for retention on active duty beyond 30 years of active federal service.

All CSM who will complete 30 years of service during the period October 1, 1979 to September 30, 1980, inclusive, with basic active service dates between October 1, 1949, and September 30, 1950, were considered unless they declined consideration.

Those CSM selected will be authorized additional active duty up to 35 years of active federal service, or to age 55, whichever occurs first.

All active CSM, except those who decline, are considered for retention beyond 30 years during their 28th year of service. Selection is based on outstanding performance, demonstrated initiative and significant potential for valuable service in positions of responsibility in accordance with specific guidelines established for the board. Retention is not a reward for past performance, but is based on potential for continued outstanding performance of duty.

NCO Channels

(EDITOR'S NOTE: This section is devoted to an exchange of information between NCOs of the Engineer School and field units. Ideally, points of contact for this channel of communication should be the Command Sergeant Major of the Engineer School and Command Sergeants Major of engineer brigades, groups and battalions.)

ENCOA

Information contained in the Spring edition of THE ENGINEER is still valid for Non-Commissioned Officers selected to attend the Engineer NCO Advanced course. The course will undergo redesign to bring it in line with Skill Level Four soldiers manuals and new doctrine and training techniques. More about the revision of ENCOA will be included in the Fall edition of THE ENGINEER.

If you want personal advice on what you can do to prepare for ENCOA, here is an offer you can't refuse. Write a letter to the Commander of the NCOES Detachment (he's enlisted), and tell him your strong areas and not-so-strong areas, and a little on your experience and background. He will give you a reply and advise what you can do to insure that you are prepared. The address is Commander, NCOES Detachment, Ft. Belvoir VA 22060.

The lack of basic math and reading skills is still the biggest deficiency of ENCOA students. Consider going to your Education Center for help in these subjects. A twelfth grade equivalency is recommended for ENCOA students.

Soldier's Manuals

The Engineer School will fill individual requests for Engineer Soldier's Manuals. If you were left out in the initial distribution of manuals or did not receive the necessary number of manuals, here is how to obtain your individual copy. In the back of each Soldier's Manual is a re-order card. Fill it out and send it in. If you do not have a re-order card, send us a letter, identify the Soldier's Manual you want and we will send it to you (please enclose a self-sticking label with your name and address on it). Forward your request to: Commandant, US Army Engineer School, Attention: Mat Dist, Bldg S-215, Ft. Belvoir VA 22060. Please keep in mind that this service is provided for individual soldiers only.

If you are at Skill Level Two, you should have the Skill Level One and Two manuals plus the Skill Level Three manual. If you are at SL3, you should have the SL1, SL2, and SL3 manuals, plus the SL4 manual. If you are at SL4, you should have all four manuals, plus the Commander's Manual.

All Engineer Soldier's Manuals have not yet been printed and distributed. Here are the manuals we had on hand as of June 1978: 12B—SL1, SL2, SL3, SL4, and Commander's Manual; 12C—SL1, SL2, SL3, SL4, and Commander's Manual; 12E—SL1-4, plus the Commander's Manual; 62B—SL1-4, plus the Commander's Manual.

Correspondence Courses

Interested in enrolling in an engineer correspondence course? USAES Pamphlet 351-20 is where you find a listing of available courses. Applications should be forwarded on DA Form 145 to: Army Correspondence Course Program (ACCP), US Army Training Support Center, Newport News VA 23628.

Do not send your application to the Engineer School. It will only delay your enrollment. Since February of 1977, the Army Training Support Center has been responsible for distribution and administration of all Army correspondence course programs.

The Training Support Center also maintains records on student enrollment and answers questions on the administration of the engineer correspondence course program. Please address administrative questions to the same address above. However, if your questions deal with subject matter, errors, clarification or technical accuracy, write to the Engineer School, attention ATSE-DT.

The Engineer School writes and revises engineer correspondence courses, while the Training Support Center administers the program. Recently issued subcourses have two student inquiry sheets included. The one for administrative inquiries should be sent to the Training Support Center and the one for subject matter inquiries should be sent to the Engineer School.

If your unit training section does not have a copy of USAES Pam 351-20, ask your training officer to request a copy on DA Form 17 or send a written request to the Engineer School, attention ATSE-DTR (Indiv Tng Sec).

Primary Technical Course

PTC for 12C (Bridge Crewman) is alive and well at Fort Belvoir. Units interested in the course or having difficulty obtaining information on it, please contact the Command Sergeant Major, US Army Engineer School.

Instructional Material Catalog

The Engineer School has a great variety of instructional material available to assist engineer units in designing their training programs. Material consists of the traditional lesson plans, special texts, student workbooks, programmed texts, and pamphlets, plus a new generation of training helpers.

For example, the Training Package is a "how-to" oriented document which focuses on a single task or several related tasks. And the Task Training Pamphlet is a booklet which offers step-by-step guidance and information on training designed to accomplish ARTEP tasks. The pamphlet does not include specific instructional material, but, rather, offers guidance for conducting training.

The material contained in the Instructional Material Catalog should not be confused with correspondence courses in engineer subjects which are offered through the Army Correspondence Course Program. The catalog lists material that is used to support resident instruction at the Engineer School and is made available to field units to assist them in preparing similar instruction at unit level.

If your unit training section does not have a copy of the Instructional Material Catalog, send a completed DA Form 17 or written request to the Engineer School, attention ATSE-DTR (Indiv Tng Sec).

Take a close look at what the Engineer School has to offer and use it in developing your own training program. Normally, one copy of available training material will be sent to a unit upon request.

An additional source of assistance in the development of unit training programs is the Engineer School Command Sergeant Major. Unique problems should be addressed to him at the Engineer School, attention ATZA-CSM.

Training Assistance Catalog

Have you ever wondered where to turn for training assistance? If so, a catalog published by the Engineer School is an ideal source. The Engineer Training Assistance Catalog should be an integral part of every unit's reference library.

The catalog lists training resources available to assist training managers in performing their duties. The intent of the catalog is to serve as a guide for identifying alternate methods of training for readiness. The resources listed are not designed to relieve you of your training responsibilities, but to fill gaps in your training capabilities.

The catalog also includes support available from the Engineer School, the US Army Engineer Training Center, and the Defense Mapping School. In addition, locations and addresses of Army Readiness Regions/Groups, Maneuver Area Commands, Maneuver Training Commands, USAR Schools, Engineer Districts, Training Aids Service Centers, and other Army service schools and colleges are listed.

To obtain a copy of the Engineer Training Assistance Catalog, unit training officers must forward a DA Form 17 or written request to the Engineer School, attention ATSE-DTR (Indiv Tng Sec).

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Reserve Components

SQT Review

Army Readiness Regions have assigned the mission of SQT review, by MOS, to specific USAR units. These reviews are urgently needed to tailor the SQTs for USAR use. During review, particular attention will be given to equipment shortages, USAR-unique MOSs, adequate training support, needed training time, and facilities. Record testing of Reserve Component personnel, by MOS, is expected to begin approximately one year after testing begins for Active Component personnel in the same MOS.

New Regs

Two new Army Regulations on Reserve Component activities became effective on July 1. AR 135-300, a revision of the old reg based on findings from the Command Post Exercise MOBEX 76, deals with mobilization of the USAR. The other new reg, AR 220-1, is concerned with unit readiness reporting procedures.

Those procedures, according to the new reg, will now be known as "Unit Status Reporting." Other major elements of AR 220-1 include the following:

—Descriptions of Readiness Conditions (REDCONs) have been changed. Ratings 1, 2 and 3 will now be considered "ready," while rating 4 will be considered "not ready." The old descriptions of "marginally" and "substantially" have been dropped.

—Unit Modification Tables of Organization and Equipment (MTOE) will henceforth be annotated to indicate which equipment items are mission-essential and therefore reportable.

—The "snapshot" procedure of measuring equipment availability at the end of the reporting period will be dropped.

—Major unit ratings (for divisions, separate brigades and armored cav regiments) for personnel and equipment will be based on composite ratings for maneuver, fire support and support units.

—All C4 units will submit an estimate of the percentage of the wartime mission they can accomplish.

—The reporting dates shift to October 15 and April 15.

The new AR 135-300 supersedes the old AR 135-300 dated February 1973 (including all changes), AR 135-20 dated December 1971, AR 135-301 dated July 1973 (including all changes), and Chapter 4 of AR 135-210 dated March 1977.

Maintenance Survey

The Chicago based 416th Engineer Command has been given the job of conducting maintenance visits to every Reserve center in the United States. Also, surveys will be made of inactive and semi-active installations to determine the engineering effort needed if it be necessary to re-activate those installations in the future.

The entire job will be accomplished by Reservists on a equivalent or annual training basis.

It's a big job. There are over 1,100 Reserve centers across the country. To handle the task, the 416th will create six Area Support Centers and approximately 30 survey teams to conduct the maintenance and repair visits.

A typical Survey Team will consist of three officers and two enlisted people. To qualify as a team member, an officer must have a degree in engineering, architecture or science and have 10 years of construction-related experience. A professional registration as an engineer or architect is desirable. Enlisted persons are required to have at least eight years experience in a construction-related field.

Interested Reserve personnel should contact the 416th Engineer Command at 4454 West Cermak Road, Chicago, Illinois, 60623.

Records Review

Army Reservists visiting the Washington, D.C. area may now review their Official Military Personnel File at the US Army Military Personnel Center in Alexandria, VA. To request a records review, call the MILPERCEN Reserve Affairs Advisor's office at autovon 221-8835, commercial (202) 325-8835, or write to Headquarters, MILPERCEN, ATTN: DAPC-MS-RA, 200 Stovall Street, Alexandria, VA 22332. Thirty days notice is required. Records must be requested by MILPERCEN from the Reserve Components Personnel and Administration Center in St. Louis, Missouri.

Troop Strength

Army Reserve troop unit strength remains at approximately 189,000 while recruiting efforts aim at reaching 252,000.

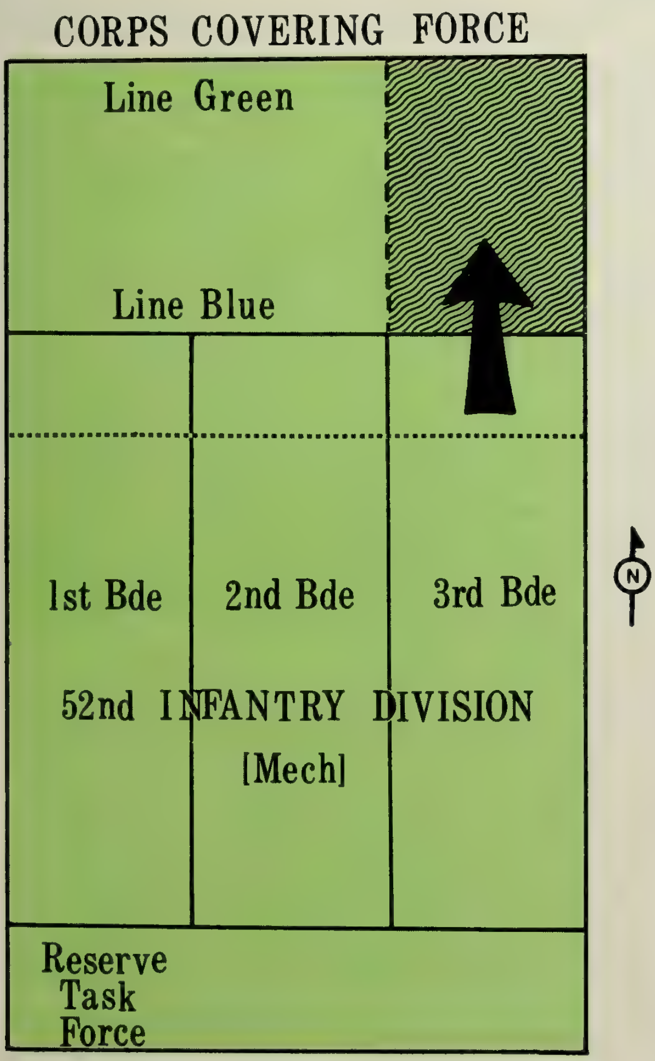
—Reserve officers on statutory tours or not on extended active duty have until July 1979 to enroll in US Army War College Non-resident Courses. Write for HQDA Letter 351-76-1 from TAGCEN, DAAG-PAP-A (M), Washington, D.C. 20310.

—As of February 1978, men and women both incur six-year obligations upon enlistment. Reservists may serve all six in troop units, or four in units and two in the IRR, or three in units and three in the IRR.

Tactical Problem

You are a company commander in the 52nd Combat Engineer Battalion, 52nd Infantry Division (Mechanized). For the last 24 hours you have been in direct support of 3rd Brigade, 52nd Division. The 3rd Brigade has a defend-in-sector mission and is expected to assume the battle at security line Blue in 24 hours. A Corps Covering Force is delaying forward of line Blue and is currently located just north of line Green. A second Corps engineer company was detached from your brigade the day before for a contingency in the 54th Infantry Division's sector to the East. The Covering Force on the East has been practically neutralized in actions over the last 12 hours.

The Division Commander has ordered 3rd Brigade to reinforce and assume command of the Covering Force at line Green in the projected sector shown in the upper right corner of Figure 1. He has directed the division Reserve Task Force, which is currently located behind 1st Brigade, be attached to the 3rd Brigade. The Corps Engineer is redirecting Corps assets and the brigades will have a Corps Combat Engineer Company attached to it with the arrival of the Reserve Task Force. The new Division Reserve will be constituted from elements of the Corps Covering Force passing through 1st and 2nd Brigades. The enemy situation forced this decision and the terrain favors the enemy to continue to attack evenly along the division front. This is not the normal enemy tactic and at this time he has not formed the expected breakthrough attack. The brigade must assume the delay at line Green in two hours.



Engineer Situation

You have accurate reconnaissance date and have estimated the following tasks and time required to accomplish those tasks in support of the 3rd Brigade:

COVERING FORCE AREA
(Between lines Blue & Green)

Tasks	Time Required*
Road Craters	1.5
Bridge Demolitions	0.5
Minefield/Tank Ditch	1.2

MAIN BATTLE AREA
(Near line Blue)

Tasks	Time Required*
Prepare counterattack routes	1.5
Improve Supply routes	1.5
Prepare alternate Brigade TOC	0.5
Road Craters	1.5
Bridge Demolition	0.2
Tank ditches	0.5**
Minefields	1.5**

NEAR BRIGADE REAR BOUNDARY

Tasks	Time Required*
Improve supply routes	1.5
Prepare Class III & IV protective devices	1.0
Road craters	1.5
Bridge Demolition	0.5
Minefields	3.0
Tank ditches	1.5

(*In Platoon Days; rest and safety factors considered)

(**Already started, time needed to complete)

Problem

Task organize your engineer company. The brigade has one day to delay in front of line Blue and 2–3 days to defeat enemy in sector.

(For solution and discussion, see page 40)

Tactical Problem

The School Solution

The entire company will execute the tasks in the Covering Force sector during the delay on the first day. First priority is always forward to this area. The 3rd Brigade's only mission the first day is to delay. Engineer assets will be used in the Main Battle Area (MBA) only if available. In the situation presented here, some work has started in the MBA and the Reserve Task Force (RTF) will not arrive until later. It can work with the second engineer company upon arrival.

In all cases, engineer priorities mirror tactical priorities and reflect the maneuver commander's plan.

Tasks for the Covering Force Area (CFS) require 3.2 platoon days. If the excess 0.2 days of work cannot be accomplished, the combination minefield/tank ditch task would be acceptable at about 85 percent of its desired design. Priorities for the second and succeeding days in the MBA would also progress from front to rear. In all cases, engineer priorities mirror tactical priorities and reflect the maneuver commander's plan. The situation presented indicates that where there are conflicts the following **tactical** priorities would exist: (1) Survivability, (2) Mobility, (3) Counter-mobility and (4) General Engineering.

Survivability, the top tactical priority, is least important on the engineer task list. In the situation presented here, maneuver troops are doing most of the work. If survivability is beyond their control, engineer resources should be called upon. Mobility is the next priority required by tasks for counter-attack and supply routes. The active defense maintains the initiative by offensive actions, while the supply routes insure the success of the offensive actions. Counter-mobility is the third tactical priority and is achieved by multiplying our firepower with obstacles. The top three priorities should be executed simultaneously. However, where there are resource conflicts, the priorities stated above apply.

Even though counter-mobility is the third tactical priority, it is the predominant engineer task in the situation presented here and is, in fact the first and only engineer priority during covering force operations.

Even though counter-mobility is the third tactical priority, it is the predominant **engineer** task in the situation presented here and is, in fact, the first and **only** engineer priority during covering force operations.

During each phase of the tactical operation engineer priorities may differ from the listed tactical priorities. Survivability may become the second or third priority of engineers as the tactical commander assesses his own tasking priorities in his scheme of maneuver. Counter-mobility may be first priority for many engineer units before hostilities begin. Mobility may drop to third priority in the MBA during covering force operations or claim top priority during the actual MBA battle.

Engineers should remember how their priorities fit into the overall tactical plan so that intelligent changes can be made as the situation changes. General Engineering tasks are not listed in this situation but probably include a battalion water point in general support.

In summary, the one principle that never changes is that the engineer's first priority is to support the tactical plan. The corollary to this principle is that combat engineer support is oriented to the front.

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We Are The Engineers

THEY'VE called us many things in many armies through the years—
sappers, diggers, moles, pioneers and more lately engineers.
But no matter what the name, always they have called us when they needed men
skilled with shooting irons as well as building irons.
WITH axe and ox we built the road through the stark wilderness for General Braddock
(had he hearkened to that young surveyor—and surely a surveyor's an engineer—
name of Washington, history might have told a different story there)
and later built the circling earthworks at Boston
and drew the admiration of another British general.
And you can still see the works we helped our allies build at Yorktown
to tumble still another, and end the war that won our independence.
IN TIMES of peace we turned to educating ourselves for the uncharted future,
and from the classrooms at West Point came the Nation's first trained engineers,
those same men who, in or out of the Army, charted roads, built the rail lines,
the bridges, the canals, who rechanneled the rampaging rivers.
AN engineer, one Captain Lee, found the way through the trackless
lava fields that guarded Chapultepec.
We built the famed long bridge 'cross the James
and the entrenchments at Petersburg that hemmed that same gallant Robert E. Lee
and forced the fall of Richmond.
AROUND the turn of the century we built that ditch across the Isthmus of Panama,
then first to meet the foe with rifles replacing shovels, first Americans to die on Flanders Fields
were the fighting breed of men, the combat engineers.
LATER in Europe, Africa, Asia we built the roads and airfields
and bridged a hundred rivers and always we fought as we built.
In distant Korea we repeated those same jobs.
In other far-off lands we built the roads and posts and fought a wily foe.
Tools and weapons as well as names have changed through the years. But the spirit is the same.
Always we are builders who can fight. And we are destroyers as well, who know how to
demolish enemy defenses. The Army's Builders, Destroyers, Fighters . . .
WE ARE THE ENGINEERS.

ENGIN.

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THE COVER

Soldiers master the basic engineer skills during One Station Unit Training at Fort Leonard Wood, MO. By Staff Sergeant Mike Furr.

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Information for Contributors

THE MAGAZINE. The Engineer is an official Department of the Army magazine which provides timely and authoritative information on Army engineering concepts, plans, policies, doctrine, procedures, operations, and developments to active Army units, reserve components, and national guard units. As a medium for disseminating information, it seeks to increase understanding of the role and importance of Army engineering and to promote the professional development and knowledge of officers, enlisted personnel, and civilians engaged in Army engineering activities.

WRITERS. The primary requisite for being published is your message, not your writing ability. If you have something of value to offer, whether it be in the form of a feature article, announcement, photograph or illustration, we want to hear from you.

SUBJECTS. The Engineer uses articles on all activities of Army engineering, from item development to item disposal, from field utilization to support operation. The scope of the coverage includes all functions at all levels, from Department of the Army staff to the smallest field units.

STYLE. Clean, concise manuscripts written in the third person, active voice are preferred. Strive for simplicity in your word selection, and sentence and paragraph construction. The editor reserves the right to edit all manuscripts to conform to The Engineer style. Substantial technical changes will be made only with the author's consent.

MANUSCRIPTS. There are no prescribed limits for manuscript length. A news item may vary from one sentence to several paragraphs. A pictorial feature may be several hundred words. Feature articles are generally from 1,000 to 3,000 words, but may be longer or shorter in length. A single copy of a manuscript is sufficient, typed and double spaced. Pictorial or art support is not necessary, but certainly helpful. Manuscripts should NOT be under editorial consideration elsewhere at the time of submission to THE ENGINEER. Manuscripts should contain no classified material. If necessary, we will submit material to the Office, Chief of Public Affairs, for security clearance prior to publication.

PHOTOGRAPHS. We solicit photographs for consideration. They are important in clarifying and explaining your manuscript. They also increase reader interest. Offset printing demands clear, sharp photography. Polaroid photographs are generally not acceptable. Photographs preferred are 8″x10″ glossy, black and white prints, with captions. Identification, including first and last names and middle initial of all persons in each photo, should be typed on a separate sheet of paper and taped to the back of each print.

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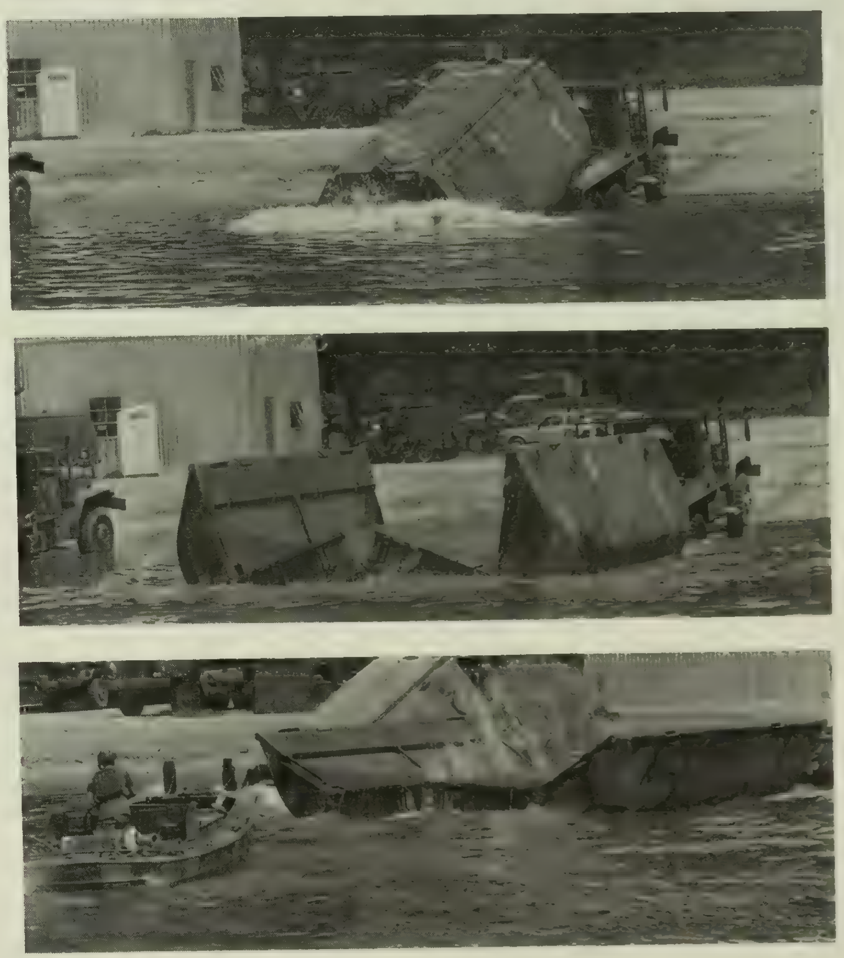
News & Notes



Ribbon Bridge

Ribbon bridges have long been an important asset of combat engineers due to the speed and ease of assembly. The 902nd Engineer Company (FB) 11th Engineer Battalion (CBT), Fort Belvoir, demonstrated ribbon bridge advantages during a recent "Float-by" at the U.S. Army Engineer Center and School. Unloading (top photo) takes just two men and very little time. The bridge section unfolds (center) by itself. Separate spans, once off-loaded and unfolded, are pushed together (bottom) by a bridge erection boat. A complete bridge can be assembled and operational within minutes. (Photos by Gid Pool, Jr.)

Training Brigade

The Engineer Training Brigade has been organized at Fort Belvoir, VA, effective 1 October. Its primary missions are the training of soldiers in the repair courses taught at Fort Belvoir and the care of all students at the school. The Engineer Training Brigade (ETB) is commanded by Colonel Kerwood W. Barrand and the Brigade Command Sergeant Major is CSM Donald W. W. Elms. The ETB consists of three battalions organized from the Engineer Center's existing personnel resources. The 1st Battalion includes instructors and students of the 52D Power Generator Equipment Repairman Course. The 3rd Battalion retained its old configuration and mission of command and control of students attending the Advanced Officer Course, Basic Officer Course and Advanced NCO Course. The 3rd Battalion also includes the Advanced Individual Training Company for students attending the Defense Mapping School and the Foreign Student Support Detachment. The 4th Battalion includes students and instructors of the 35E Special Electrical Devices Repairman Course and the 52C Utilities Equipment Repairman Course. In addition, students attending the 12E Atomic Demolition Course and the Soils Analyst Course are billeted in the 4th Battalion.

Drill Sergeant of the Year

A Combat Engineer, Sergeant First Class Dennis D. Watters, has been selected as the active Army Drill Sergeant of the Year. SFC Watters, whose MOS is 12B4X, was assigned to Headquarters and Headquarters Company, Training Group, Fort Leonard Wood, MO, at the time of his selection. He has since been reassigned to Headquarters, Training and Doctrine Command, Fort Monroe, VA, where he will serve a one-year tour as advisor to the TRADOC commander on the drill sergeant program.

Commemorative Plaque

The U.S. Army Engineer School at Fort Belvoir, VA, has been presented a bronze plaque commemorating the 200th Anniversary of George Washington's "call" for engineering education. The plaque is a duplicate of the one which was unveiled at Valley Forge earlier last summer. Major General James L. Kelly, post commander and commandant of the Engineer School, accepted the plaque from General (Ret.) Bruce E. Clarke during ceremonies on Long Parade Field at Fort Belvoir. The plaque was donated by the Freedoms Foundation and the National Society of Professional Engineers. It is currently on display in the Engineer Museum at Fort Belvoir.

Universal Engineer Tractor

Congress has appropriated $10.6 million for initial production of the Universal Engineer Tractor (UET) during Fiscal Year 1979. Initial Operational Capability-Force Development Testing and Evaluation is scheduled for the third quarter of FY 80. Army engineer field units should receive the first UETs by early 1982 if additional funds are appropriated during the next two years.

CETEX '78

A German engineer guards a mined road at Military Training Area Baumholder during CETEX '78, which is the annual Central Army Group (CENTAG) Engineer Training Exercise designed to provide combat engineers with a fundamental knowledge and understanding of the equipment, barrier munitions and doctrine of their allies. CETEX '78 was hosted by III German Corps from 22 May to 1 June. Participating forces included the II and III German Corps, V and VII U.S. Corps, the 4th Canadian Mechanized Brigade Group, the II French Army, the I Belgium Corps, and the German Territorial Southern Command.

News & Notes

Bridge Builders

Members of Company C, 1st Engineer Battalion, Fort Riley, KS, assemble an M4T6 float bridge on the banks of the Big Piney River at Fort Leonard Wood, MO. Ninety-eight soldiers assigned to Company C convoyed to Fort Leonard Wood late last summer to undergo 13 days of bridge-building training in preparation for an ARTEP exercise at Fort Riley this November.

Letters

Dear Sir,

Some of my fellow EOAC students believe too much time is allotted to tactics instruction at The Engineer School. For three reasons I disagree with this:

(1) Observations obtained in Vietnam have led me to believe that Engineer officers tend to be weak in tactics though proficient in general engineering. Observed instances of slow perimeter defense establishment, long ambush reaction times, lax job site security, inability to use supporting fires, and misunderstanding between engineer and maneuver units have led to this belief.

(2) In many armies the Engineers are closely integrated with the maneuver units with a resulting increased effectiveness of those armies. This does not seem to be true of U.S. Army Engineers. We tend towards an "Ivory Tower" attitude towards everything except construction engineering. Successful modern warfare in general and European warfare in particular requires close coordination between Engineers and other branches. To realize their full potential Engineers must be able to participate in the early stages of tactical planning. This requires an understanding of tactics which Engineers do not always possess.

(3) Tactics may not be the most interesting of subjects to an Engineer, but required combat use will make it the most important. An officer who has not been in combat, which includes most of the EOAC students, tends not to appreciate this.

With these observations I submit to my fellow students the belief that the current time allotted to tactics is insufficient rather than excessive. I believe the concentration of effort should be towards continual improvement of the subject matter and its presentation rather than reduction of allotted time. An Engineer officer must have a thorough knowledge of tactics to function as an integrated member of the combined arms team and to fulfill his battlefield responsibilities to his personnel. This knowledge comes only with time and effort.

1LT LARRY W. JINKINS
Class 3/78 EOAC

The combat role of Army engineers is often overshadowed by their construction, nation-building, and water resource management missions, particularly during peacetime. Yet, when the Corps of Engineers was redesignated a member of the Army's Combined Arms Team in September 1975, it shouldered an equal burden with the Infantry, Armor, Field Artillery, and Air Defense Artillery in our national defense. Lieutenant General John W. Morris, Chief of Engineers, was asked about that responsibility and other matters related to the combat role of Army engineers during a recent interview with THE ENGINEER.

An Interview with The Chief★★★

THE ENGINEER: In September, 1975, the Corps of Engineers was redesignated as a combat arms. How have the other combat arms accepted the change and what do you think engineers can do to increase that acceptance?

LT. GEN. MORRIS: The Corps of Engineers will always be recognized as being more than just a combat arms. We do other things in a support role and in service to the Army. As I see it, we support the Army in four categories—on the battlefield, in garrison, during mobilization and by doing a lot of special tasks. Our combat arms mission falls only in the first category, support on the battlefield. I think there is full acceptance of engineers as part of the combined arms team by the troop units, the infantry divisions, those forces which will be deployed in the combat zone. But we ought to get it straight. Engineers did not return to the combat arms simply because the Corps wanted to. That wouldn't have been good enough. The reason we came back is because the other members of the team wanted us back. Our field commanders are very, very aware of the importance of engineers to their operations. I am concerned, however, on two scores. First, I believe the engineer should be more involved in planning the battle or operation as well as in executing it. At present, the emphasis on execution is about right, but I think the emphasis on helping to plan the battle is too limited. Why? Well, the kinds of warfare ahead of us will rely heavily on mobility, countermobility, survivability, and general engineering. But even more importantly, if field commanders want to change the terrain to maximize its use, engineers are going to have to do it. So we might as well help the commander plan his operation. The other deep concern I have—and I may be wrong—is the assumption by field commanders that engineer capability available equals the engineer effort they expect. I'm concerned that field commanders are assuming engineer capability to be greater than it really is, in fact. The relative mobility of engineer units on the battlefield is considerably less than the combat units they fight with. The D-7 tractor doesn't have the mobility of the personnel carrier or the tank or self-propelled artillery. And I'm not sure the commander of the combined arms team is fully aware of the shortfall of engineer mobility in relation to his other units. The combined arms commander's assumptions are not necessarily tested during peacetime field operations. But in wartime, it would become eminently clear quickly that the mobility he expects from his combined arms team is less than he expects.

"I think there is full acceptance of engineers as part of the combined arms team by the troop units, the infantry divisions, those forces which will be employed in the combat zone."

"If field commanders want to change the terrain to maximize its use, engineers are going to have to do it. So we might as well help the commander plan his operation."

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"While our troop units may be more equipment intensive today, we expect a lot more of the individuals who have this new equipment than we expected of the individuals who had only rifles to fight with."

THE ENGINEER: Won't the Universal Engineer Tractor (UET) and other new engineer equipment now being developed increase the mobility of combat engineers?
LT. GEN. MORRIS: When we get the UET in the hands of our divisional units and support battalions, I will be much more relieved that engineer capability will be, in fact, what the commanders are presuming it to be. But that equipment is not there yet. The lead time on new equipment is long. Fortunately, we are at the threshold of production, and we could be seeing the UET in the hands of our troops in the next couple of years.

THE ENGINEER: What, if anything, can your office do to help solve the funding problems facing the UET?
LT. GEN. MORRIS: There's generally good support for the UET. General Blanchard (USAREUR Commander) has sent a message stating how badly he wants it. And I think the program managers who support this item before the Congress are convincing. But I don't know whether it's a matter of priorities before the Congress, competition from the construction equipment manufacturers, or what, but so far we've not been able to get the UET into production. Once we get it into the hands of our troops, I think our field commanders will realize what a disadvantage they're at with present equipment. I'm optimistic we will get it funded, but I was also optimistic last year.

THE ENGINEER: There seems to be a trend in the development of our engineer TOE to become more equipment intensive and less manpower intensive. What is your reaction to this trend?
LT. GEN. MORRIS: That's not only true, but it's inevitable. And I believe it's proper. Why? Well, our army is mechanized relative to the Army of World War I and World War II and maybe even Vietnam. A man's capacity to influence the situation on the battlefield is a function of the equipment we put into his hands, much more than it was before. That's been an evolutionary thing. And what we have now is a continuation of that evolution that carries with it some other considerations. While our troop units may be more equipment intensive today, we expect a lot more of the individuals who have this new equipment than we expected of the individuals who had only rifles to fight with. So we have to get much more out of the individual soldier than we used to.

THE ENGINEER: Many soldiers contend that the nation-building role of the Corps, both at home and abroad, diverts the attention and resources of the Corps from its most important mission—combat engineering. What is your response to this concern?

LT. GEN. MORRIS: Well, I don't disagree that the combat engineer role is our most important responsibility, but I do disagree that it is the only thing we can do and do well. In fact, I'm more convinced as the Chief of Engineers than I ever was before that the engineer support to the Army, at all levels, has historically been a direct product of the responsibilities we give our young officers and middle grade officers in other-than-combat engineer assignments. I have the highest regard for the combat engineer troop commander, but I'm also convinced that the very best engineer service that is given the Army and the United States in the field has historically been a product of engineer lessons learned in assignments other than, and in addition to, the troop assignment. I just do not believe that the United States Army could successfully mobilize for war without a peacetime role for its engineers and I don't believe we could have accommodated the kinds of construction associated with World War II and Vietnam—ports, railroads, massive airfield construction, major depot projects—with officers who had served only as troop commanders. I just don't think it would have been possible. Of course, the other side of the coin is the very significant contribution the Army is making to the nation by having its military engineers in leadership positions on those jobs which not only help build our nation, but help our allies build their nations. The Army takes pride in helping others through this opportunity for its engineers. Sooner or later, it all comes back not only to the credit but also to the benefit of the Army.

THE ENGINEER: I understand that a rather common criticism among Engineer School Advance Course students is that too much emphasis is placed on tactics and the role of the Brigade Engineer, relative to construction engineering subjects. What is your response to that criticism?

LT. GEN. MORRIS: Certainly, the criticism is valid among the students you're hearing from. Why? Well, as I understand it, we're sort of in a transition in the advance course. Whereas it used to be a course that rounded out an officer's engineering education, regardless of his next assignment, it is now designed as a pre-company command course. In other words, graduates of the advance course are now expected to become company commanders in their next assignment. I think that's part of the problem. As Chief of Engineers I would like to see that course include some of the skills an engineer officer must have in construction and service support to the Army. On the other hand, until an officer has been a company commander, that should be his next objective.

THE ENGINEER: There are many officers who would like to see the Engineer Officer Specialty (21) split into two or more specialties. What are your views of the pros and cons of such a proposal relative to the status quo?

LT. GEN. MORRIS: Well, certainly there are factors on both sides. I've given that a lot of thought. And I prefer it the way it is. It enhances the engineer officer's utility to the Army and also his opportunities for promotion, particularly as he goes into the field grades. Just the nature of what the Army expects of its engineer officers requires us to have perhaps the busiest career field of all. We not only have to be good at leading our

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"I kind of feel the place we need to increase engineer strength is in direct support elements."

troops, but we have to be branch qualified, as I would call it, in a technical sense. We must be proficient as a facilities engineer, in the military construction field, or in the public works field. The engineer officer has to kind of hustle. He shouldn't spend any more time in one of these experiences than is necessary for him to become proficient in it, and then he should move on to another assignment opportunity if he can arrange it. I am concerned that we get officers into troop units or into particular positions in a stabilized tour and they stay there three years. Well, I just don't believe there's enough learning experience requiring three years attention in any one assignment. I think in a three year period he should get more than one opportunity. It's done that way in some cases but not enough. Everytime I go through this problem, I always come out the same way—the Corps of Engineers and the individual officer is better served by having a single engineer specialty than by having more than one. But I think we should be very careful not to allow our young officers to spend too much time doing the same thing.

THE ENGINEER: Some engineer officers believe that engineer companies should be commanded by majors rather than captains. What is your opinion on that?

LT. GEN. MORRIS: Well length of service is a more important criteria to me than grade in terms of ability to run a company. The rationale for majors commanding companies has to be founded on the difficulty of the job as they perceive it. I just don't think it would be justified except under very unusual circumstances.

THE ENGINEER: Some officers say that an engineer battalion cannot adequately support a division on the battlefield. What are your thoughts along that line?

LT. GEN. MORRIS: To me, that's at least a two battalion job. I guess the question is whether there should be an engineer group, rather than battalion, in each infantry division. Well, I can visualize circumstances where that would work, but I'm inclined to think we ought to build the battalion to do the job that is needed and then support it directly with additional engineer units which are non-divisional. I kind of feel the place we need to increase engineer strength is in direct support elements. There are not enough engineers in the divisional area, we all agree on that. The question that follows is should they be organic to the division or should they be immediately available to support. I'm inclined to go with the latter, providing the battalion is organic to the division to do the jobs normally expected by the division.

LIEUTENANT GENERAL JOHN MORRIS

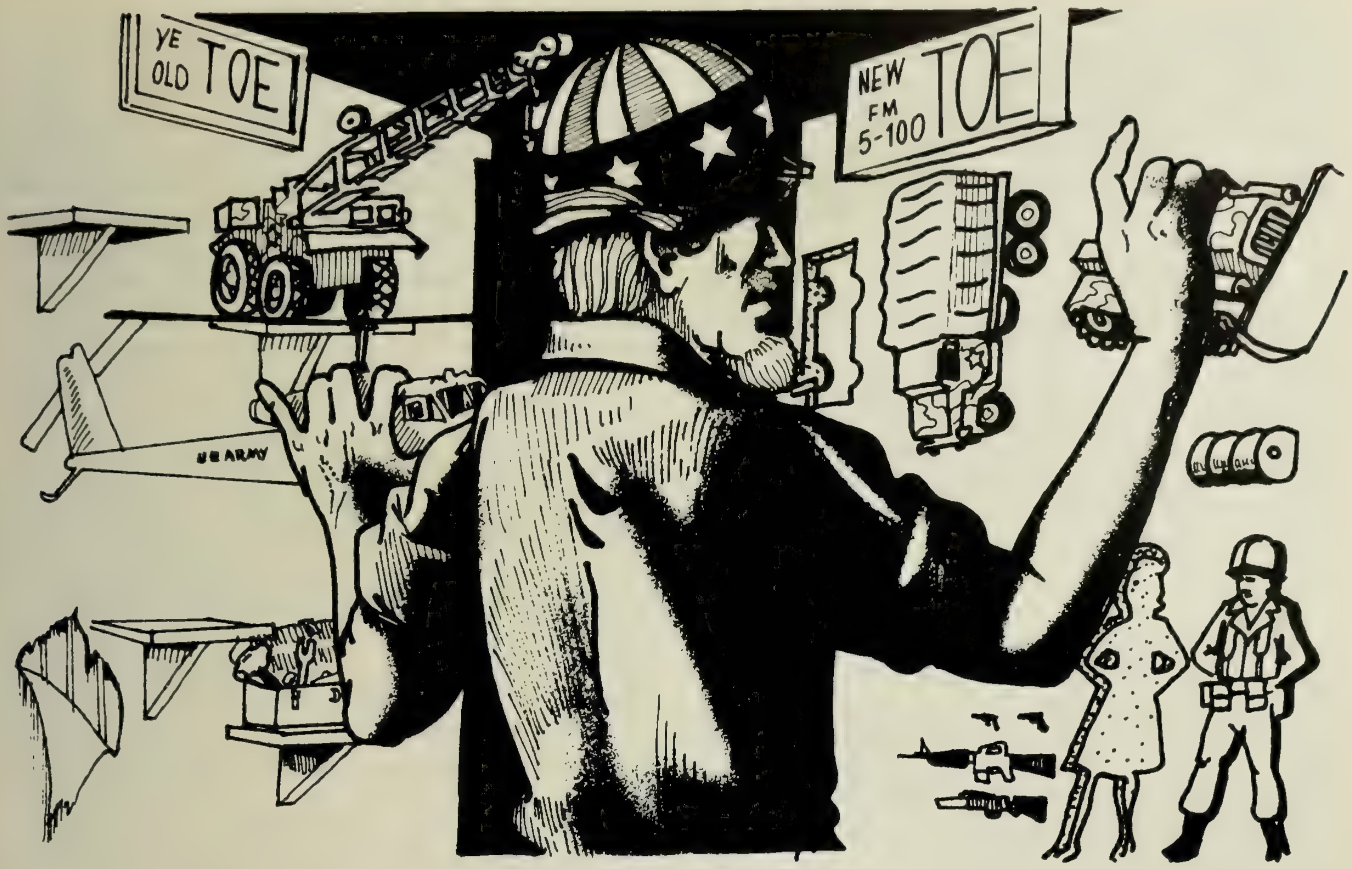
Lieutenant General John W. Morris became the 44th Chief of Engineers of the U.S. Army Corps of Engineers in July 1976. He is the engineer advisor to the Army Chief of Staff and the engineering construction agent for the Departments of the Army and Air Force. He is currently in charge of a major nation-building program in Saudi Arabia which is fully funded by that government.

He is also responsible for the Corps of Engineers' nationwide program for the development and management of our national water resources.

During his career which spans more than three decades he has commanded troops at every level from platoon to a separate brigade. His broad experience in water resources management dates back to 1952 when he was Deputy District Engineer in the Corps' Savannah District. Later, as District Engineer at Tulsa, Oklahoma, he completed several key elements of the McClellan-Kerr Arkansas River Navigation Project and subsequently served as the Corps' Missouri River Division Engineer.

As Director of Civil Works for three years in the early 70's he took major initiatives in support of the new emerging national priorities on environmental quality and energy.

General Morris holds a Master's Degree in civil engineering from the University of Iowa and is a registered Professional Engineer in Oklahoma.



The Revised Engineer Active Force

Captain James E. Meredith

The Revised Engineer Active Force (REAF) is a major effort presently underway at the United States Army Engineer School, Fort Belvoir, Virginia to update all engineer tables of organization and equipment (TO&E). The purpose of REAF is to revise all engineer organizations at one time to accommodate developmental equipment and to incorporate new concepts to facilitate "winning the first battle."

The driving force behind REAF stems from recent acceptance of new doctrine which places emphasis on countermobility, survivability and mobility (COSMO) plus close integration into the combined arms team.

This advanced doctrine, which impacts greatly on the engineer concept of operations and material development, is introduced in the engineer "How to fight" manual, FM 5-100. The doctrine has engineers fighting farther forward on the battlefield. Engineers must be combat responsive and move forward with maneuver units. Consequently, engineers systems must also move forward. This forward movement on the battlefield required organizational changes in all engineer units in order to optimize the effectiveness of engineer systems.

CURRENT ORGANIZATIONAL DEFICIENCIES

Under the present system, corps engineer units are organized primarily for rear area operations using centralized control. They lack communications or coordination capability for decentralized operations farther forward on the battlefield. Their wheeled-vehicles lack mobility to keep pace with tracked vehicles and are vulnerable to both artillery and direct fire from the opposing force.

Engineer systems are not forward where they are needed to provide COSMO support. Corps engineer units are well prepared to fight the last war with their complement of heavy construction equipment and specialized vertical construction skills. However, today's forward fighting engineers need lighter and more flexible combat construction equipment and a de-emphasis on vertical construction capability.

Division engineer units are better organized for forward fighting because of their flexibility and mobility. However, divisional engineer systems, like corps engineer units, are not forward to provide COSMO work for the combined arms team. Although the assistant division engineer staff provides liaison with the division,there is an increased need for coordination of engineer activities at the tactical brigade level. And finally, with speed and flexibility needed on the battlefield, present day divisional bridging assets need upgrading.

APPROACH AND METHODOLOGY

The urgent need to revise engineer organizations originates from awareness of the opposing force (OPFOR) tactics on the modern battlefield. OPFOR doctrine calls for a very short but devastating battle. Numerous echelons of OPFOR maneuver units preceded by intensive artillery will concentrate their efforts for a major breakthrough and push far into our battle area at a planned rate of 30-50 kilometers per day.

Current US doctrine, as expressed in FM 100-5, requires shifting and concentrating combined arms teams in depth with preparation to defend, using COSMO techniques. It is mandatory for the engineer systems to place COSMO effort farther forward.

Some of the engineer systems that are currently being developed for this role include the surface launched unit, fuel air explosive (SLUFAE); the ground emplaced mine scattering system (GEMSS); the universal engineer tractor (UET); the family of military engineer construction equipment (FAMECE); a rapid excavator; and finally some upgrading of commercial construction equipment.

The Division Restructuring Study (DRS) is a program presently being tested at Fort Hood, Texas that combines FM 100-5 doctrine with many of these new engineer systems. This study has been instrumental in laying the foundation that helped stimulate development of the new Revised Engineer Active Force.

REVISED ENGINEER ACTIVE FORCE

The Revised Engineer Active Force (REAF) reacts to FM 100-5 doctrine by revising all engineer organizations to accommodate each new and improved engineer system. The major goal of REAF is to maintain zero increase in total engineer strength in the active force structure by simply cross-leveling the assets of present engineer organizations.

Since treatment of all organization revision is similar, three typical units will be discussed that represent nearly 75 percent of the Active Army strength. These are TOE 5-145, The Divisional Engineer Battalion, Armored or Mechanized; TOE 5-35, The Corps Combat Battalion and TOE 5-115, The Combat Heavy Battalion.

Some of the general guidelines that were established by REAF include the following:

- Most line companies contain a support platoon with a COSMOS section, an equipment section, and a maintenance section.
- Engineer squads are reduced in size from 10 to eight men in divisions and separate brigades and are provided with more equipment to make them less labor intensive and more equipment oriented.
- Unlike the Division Restructuring Study, REAF divisions retain bridging and water production capability.
- The Assistant Division Engineer Section is retained in divisional battalions and an assistant brigade engineer team is created to better coordinate engineer activities with the maneuver brigade.
- For adequate command and control in the corps battalion, REAF restores squad radios and adds a second battalion command net for greater operating distances in Europe.
- With the increased need for materiel haul, REAF has maintained or slightly increased long and short haul capacity.
- Personnel administration is consolidated at battalion level with organizational maintenance retained at company level.

- REAF makes no major changes in roles and missions of engineer units. In 1985, engineer units are assumed to have only the ribbon and medium girder bridges.

The first revised organization is TOE 5-145, The Divisional Engineer Battalion, Armored or Mechanized. One improvement is deletion of graders, cranes and compaction equipment in a deliberate de-emphasis of main supply route (MSR) maintenance capability in favor of reliance on corps battalions as the divisional battalion moves farther forward in the combined arms team.

Each platoon has one combat engineer vehicle and two universal engineer tractors, thus partially offsetting the reduction in squad size from 10 to eight men. Each line company of divisional battalions has a lieutenant as assistant brigade engineer, augmented by an operations sergeant, and a driver with quarter-ton vehicle and radio for proper coordination between the company and the associated maneuver brigade. Finally, we have the newly created support platoon, one for each line company. This innovation is the organizational home of the majority of COSMO systems. It is the means of getting engineer systems forward into the companies which form the brigade team.

The next revised organization is TOE 5-35, the Corps Combat Battalion. The construction section has been reduced by half, deleting many specialized MOSs and thus de-emphasizing vertical construction capability. A significant modification to many corps combat battalions is replacement of five-ton dump trucks with armored personnel carriers as the squad vehicle. This is a new tracked version of the battalion specifically designed to operate forward with the armored or mechanized division. Each line company of the corps combat battalion also has the support platoon with the standard COSMO and maintenance section.

The third revised organization is TOE 5-115, The Combat Heavy Battalion. The general philosophy was applied to reduce the size of equipment in the line companies for greater mobility and flexibility in the newly acquired combat engineering role. Five-ton dump trucks replace 20-ton dumps, 2½-cubic yard scoop loaders replace 5-cy loaders, and D-7 dozers replace D-8 dozers with consolidation of all heavier equipment in the equipment and maintenance company. The entire quarrying and rock crushing capability has been deleted.

This move, indorsed by USAREUR, places reliance on local national sources and supporting engineer units for crushed rock and recognizes the increased combat engineering role. Most specialized MOSs have been deleted in the support section in recognition of reduced requirements for specialized vertical construction capability. There is no FAMECE or UET in the unit, but only a general upgrading of commercial construction equipment.

CONCLUSION

The REAF concept was not established to bring about a one-time revision of all engineer TO&Es. Instead, REAF presents a concept under which engineer organizations are revised on a schedule to optimize engineer systems effectiveness in line with improvements in tactical doctrine. In conclusion, REAF is a significant milestone in organizational development. It places the horse before the cart. For the first time, doctrine and organization leads materiel, personnel and training developments instead of the reverse.

REAF is a blueprint to guide organizational, materiel and training developers in making combat engineers the multiplier of combat effectiveness that FM 100-5 intends them to be.

CPT Meredith is a recent graduate of the Engineer Officers Advanced Course. He is currently assigned to Headquarters, Forces Command (FORSCOM), Fort McPherson, GA.

Combat Engineers and the Heavy Division

Major Joseph Kish

(EDITOR'S NOTE: This article describes a training exercise which placed a combat heavy engineer battalion in direct support of a maneuver division. According to current engineer doctrine, direct support to a maneuver division is provided by a corps combat engineer battalion, rather than a combat heavy battalion. Other doctrinal matters questioned by the author are being considered in the Revised Engineer Active Force (REAF) Study.)

INTRODUCTION

"Today, more than ever before, the engineer plays a critical role as a member of the combined arms team. As movement and lethality on the battlefield increase, the requirement to reinforce the terrain increases. The engineer brings to the combined arms team a terrain oriented system that enhances the capability of our weapons systems while decreasing the effectiveness of the enemy weapons."

Is the doctrine spelled out in the paragraph above, taken directly from the Coordinating Draft of FM 5-100, merely a modern substitute for "two up and one back," or can it really provide us with a roadmap for future operations?

I believe the roadmap is there. However, we must have the necessary mapreading skills to take advantage of it. Fortunately, our field units are learning those skills through training and testing. GALLANT CREW 77 provided an excellent opportunity for such training during the Spring of 1977.

GALLANT CREW 77, conducted at Fort Hood, Texas, was the large-scale Readiness Command Exercise for 1977. The free-play, two-sided Field Training Exercise (FTX) was conducted from March 26 through March 31 and included as participants both active and reserve Army and Air Force units. The major maneuver units were the 1st Cavalry Division, the 2nd Armored Division and the 6th Cavalry Brigade (Air Combat).

The 1st Cavalry Division and supporting units employed opposing forces tactics, while the 2nd Armored Division and supporting units employed U.S. tactics. The 2nd Armored Division deployed as part of a contingency corps with austere logistical support in anticipation of a short duration conflict. The setting was a high air threat-nuclear-electronic warfare environmment.

The 1st Cavalry deployed with only two companies of its divisional engineer battalion. The 2nd Armored deployed with the entire divisional engineer battalion as well as non-divisional engineer support.

It should be noted that several limitations were placed on the participants. Fort Hood is limited in maneuver area. Brigades were deployed on an 8-12 kilometer front. Similar restrictions existed in depth, resulting in a higher than desired density of combat and combat support units for such a high threat environment. Since not all radio frequencies could be cleared for Electronic Counter Measures (ECM), opposing forces could not completely utilize the ECM equipment available. Furthermore, a satisfactory method to simulate the casualty producing effects of artillery fires was not employed.

THE EXECUTION

The 2nd Armored was employed at the request of a friendly nation to counter an armed invasion from the North. Initial combat power favored the invaders by a three to one ratio. The employment of additional units by the 2nd Armored would enable the 2nd to stabilize the line of contact in the vicinity of the brigade rear boundaries. Thereafter, the 2nd Armored would be expected to attack, conduct a deliberate river crossing, and restore the friendly country's border.

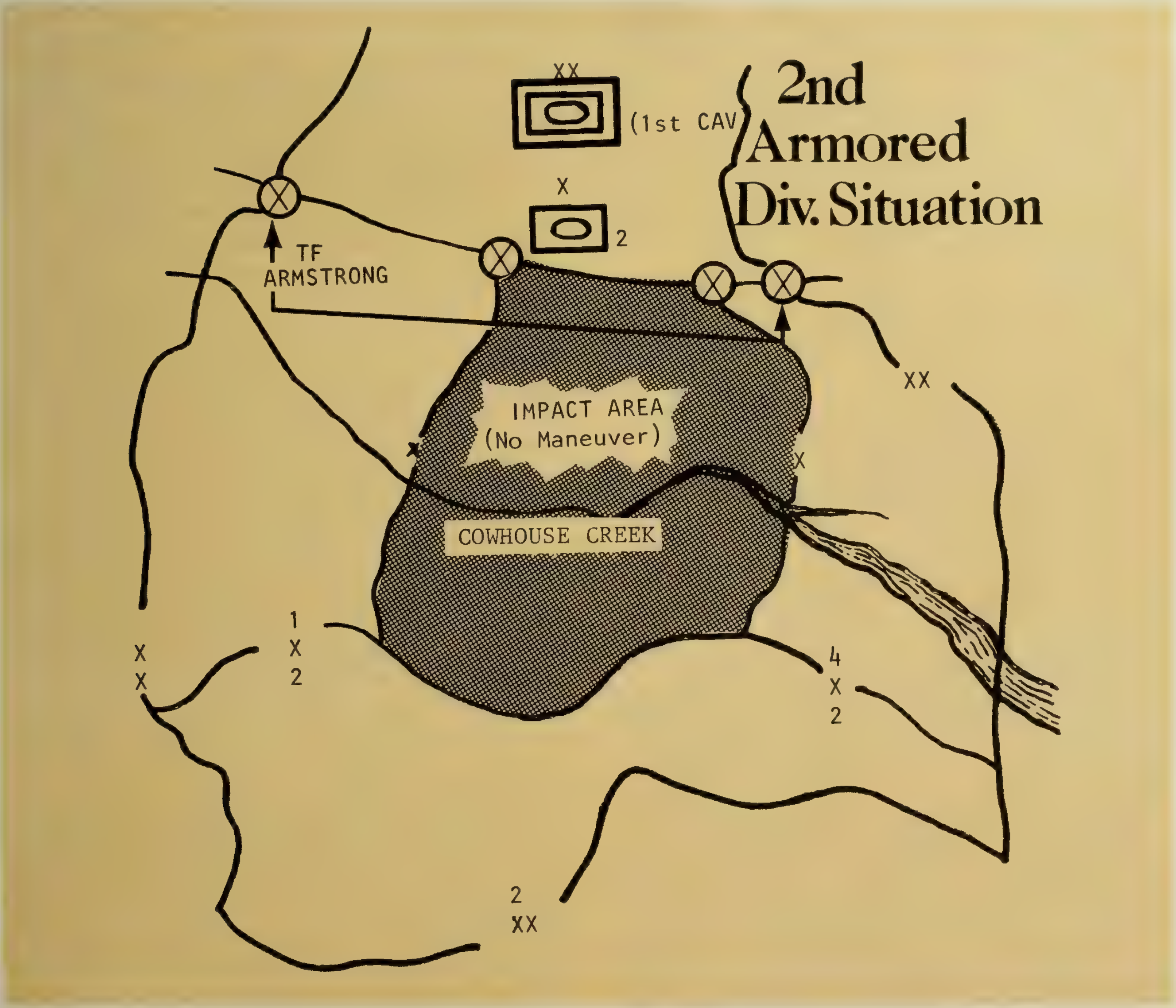
The division commander chose to defend in two phases. Phase I was a covering force mission (Task Force ARMSTRONG) and Phase II was an active defense to be initiated upon the withdrawal of the covering force south of Cowhouse Creek.

It was the first time the 2nd Armored Division had employed engineer task forces as well as a combat heavy engineer battalion in direct support. Task force commanders came from the 17th Engineer Battalion. Task Force BAKER utilized the Assistant S3 while Task Force KISH utilized the Executive Officer.

Engineers moved to the field 18 hours prior to the start of the exercise. All mines and Class IV materials to be used in the exercise were combat loaded on organic vehicles. Based on previous reconnaissance and planning conferences with maneuver commanders, work on the obstacle plan commenced immediately. Prearranged lanes to support the withdrawal of the covering force were prepared for closure. Simultaneously, prearranged lanes were prepared for closure in the other obstacle systems throughout the main battle area. The forward passage points were guarded by engineers until closure was ordered by the withdrawing unit.

In accordance with the austere logistics scenario, obstacles were not heavily dependent on logistics support. The terrain was extensively enhanced with tank ditches and earthern berms. Mines, concertina, barbed wire, logs, and preformed dragons teeth were also used. All obstacles were integrated with overwatch fires to delay the 1st Cavalry advance. All obstacles were designed to support counterattacks and sited to facilitate breaching from the friendly side.

The effectiveness of the obstacles during Phase I is best summarized by the 2nd Armored Division Commander, "That barrier was so good, and so effective, that I was able to execute a very rare tactic—retirement from action—never executed before in my life."



After withdrawal of the covering force, the 1st Cavalry was able to make only one penetration south of Cowhouse Creek. A battalion task force discovered an area not covered by fire in the far west, and by nightfall they occupied a four-kilometer salient south of the creek. The 1st Brigade staged a pre-dawn attack against this salient. Led by a platoon of Company C, 17th Engineer Battalion, selected breaches were made in an obstacle system and the attacking infantry battalion task force cleared the salient. The success was exploited, and the entire 1st Brigade attacked north along the entire front. During the next four days, no sizeable force of the 1st Cavalry penetrated south of Cowhouse Creek again.

In anticipation of the 4th Brigade conducting a river crossing, the engineers reorganized on the third day. Task force KISH released the two companies of the 62nd Engineer Battalion to their parent unit. At the same time, the 586th Engineer Company (FB) was placed in direct support of the 2nd Division.

For three days a war of movement took place, characterized by decentralized execution and extremely frequent changes to task organization. These tactics exploited successes as well as countered enemy advances.

INITIAL ENGINEER ORGANIZATION SUPPORTING THE 2ND ARMORED DIVISION

PHASE I

- TF ARMSTRONG
  - TF BAKER
    - D/17th Engr
    - F/17th Engr
- 1st Brigade
  - TF KISH (DS)
    - B/17th Engr (—)
    - C/17th Engr
    - B/62nd Engr (Cbt Hvy)(DS)
    - D/62nd Engr (Cbt Hvy)(DS)
- 4th Brigade
  - 1/B/17th Engr (DS)
- Div Troops
  - 17th Engr (—)
  - 62nd Engr (Cbt Hvy)(DS)
  - E/8th Engr
- Corps Control
  - 36th Engr Grp
    - 586th Engr Co (FB)
    - 86th Engr Det (DIV)

PHASE II

- 1st Brigade
  - TF KISH
    - C/17th Engr
    - F/17th Engr
    - B/62nd Engr (Cbt Hvy)(DS)
    - D/62nd Engr (Cbt Hvy)(DS)
- 4th Brigade
  - B/17th Engr (DS)
  - D/17th Engr (DS)
- Div Troops
  - 17th Engr
  - 62nd Engr (Cbt Hvy)(DS)
  - E/8th Engr
- Corps Control
  - 36th Engr Grp
    - 586th Engr Co (FB)
    - 86th Engr Det (DIV)

NOTE: The 17th Engineer Battalion consisted of HHC, Companies B, C, D and F as line companies, and Company E (Bridge). Company A was in USAEUR as part of Brigade '75.

It was a frag-order war, with engineer organization and missions constantly changing. Tank trails were opened and closed time and again. Armored Vehicle Launched Bridges were rapidly emplaced and removed. Coordination was essential and kept at the lowest practical level.

On the fifth day of the FTX the 4th Brigade conducted a pre-dawn deliberate river-crossing. The Crossing Area Commander was the Assistant Division Commander (Support). Company D, 17th Engineer Battalion provided crews for assault boats and far shore clearing teams that accompanied the dismounted assault elements. Vehicles with amphibious capability quickly followed across Belton Reservoir.

Upon establishing a bridgehead on the far shore, Mobile Assault Bridge rafts from both the 8th and 17th Engineer Battalions entered the water to ferry main battle tanks. The 62nd Engineer Battalion was actively engaged in improving access roads to the raft sites as well as the bridge site. Upon order of the Crossing Area Commander, pre-assembled M4T6 bridge floats were airlifted to the bridge site. Personnel from the 62nd Engineer Battalion assembled the bridge, aided by tactical smoke at the crossing sites. The 86th Engineer Detachment (DIV) assisted with underwater recovery operations. The division engineer coordinated all engineer assets in the division area.

Upon relinquishment of the river line by the 2nd Division, the 36th Engineer Group assumed responsibility for the crossing area. They regained control of the 62nd Battalion, 586th Engineer Company, Company E of the 8th Engineer Battalion, and the 86th Engineer Detachment. The 17th Engineer Battalion bridge company remained under division control and followed the attacking elements.

LESSONS LEARNED

The outcome of GALLANT CREW 77 was greatly influenced by the responsive combat engineer support. The challenge is to provide analogous support on any future battlefield.

We know that several factors influence the degree of combat power attained. They include a commander's imaginative planning, organization, and leadership, plus training and discipline of the forces, as well as the organizational factors of firepower, mobility, communications, and logistical support available. These elements form a topical outline for us to examine particular engineer lessons learned during GALLANT CREW 77.

PLANNING

Planning for the exercise was critical and highly dependent on terrain intelligence. Early in the planning process, an extensive series of engineer ground and aerial recons was made. If the engineers had waited for the formulation of the ground tactical plan prior to conducting recons, engineer supportability could have been dramatically degraded.

The withdrawal of a covering force is a delicate operation. Lanes through the obstacles must be kept open until the last friendly vehicle passes, yet closed immediately thereafter. A system for ordering closure at the lowest level possible must be devised. In this exercise, the engineer squad performing closure coordinated onsite with the scouts who led the maneuver unit through the obstacle system.

Planning for the river-crossing was a major undertaking. The 17th Engineer Battalion underwent an internal evaluation 8-11 March which emphasized river-crossing operations. Other divisional units were evaluated at the same time. Prior to these evaluations, an extensive series of coordination meetings with the division staff and participating units was required.

ORGANIZATION

The engineer organization was designed to support the initial deployment as well as to anticipate future operations. The division engineer was the focal point of the engineer support. This is an absolute requirement.

The creation of an engineer task force was found to be a valid means of centralizing direction when more than one company is supporting a brigade. However, it was found that such a task force must be provided some type of staff. The brigade commander needs an engineer representative at his headquarters at all times. Engineer units employed on a wide front also need on-site coordination of efforts. Since elements of two battalions were used in Task Force KISH, an officer from each battalion should have been furnished to constitute the task force staff.

The designation of an Assistant Division Commander as the Crossing Area Commander provided excellent control for the river-crossing. A senior commander is required considering the criticality and control problems associated with major river crossings.

Finally, the 62nd Engineer Battalion should have been OPCON to the 2nd Armored Division for this exercise, as recommended by Field Manual 5-100. Although workable, direct support did not provide the firm degree of control needed to rapidly react to the constantly changing battlefield situation.

LEADERSHIP

Engineer leadership, from the squad leader to the division engineer, was taxed during this exercise. The hours were long, the pace was furious, and the tasks were never-ending. Professionalism was essential.

TRAINING & DISCIPLINE

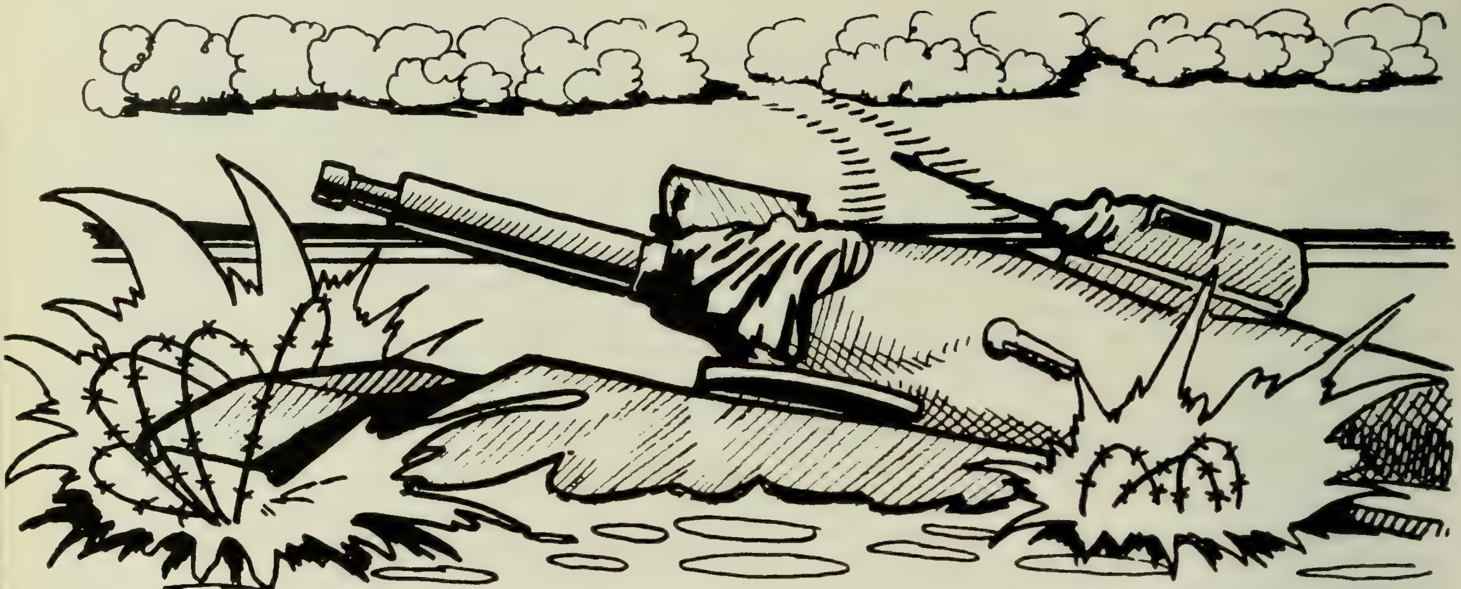
Engineer squad and platoon leaders were often required to give critical advice to maneuver commanders. The siting and construction of obstacles often depended exclusively on their skills.

The heavy ECM environment required a minimization of radio traffic. Changing frequencies, often and at random times, as well as five-second transmissions, helped overcome the ECM.

Finally, a major training advantage of this exercise was the seven-day duration. Most units had become accustomed to three-day field problems. Fatigue encountered during this exercise was more realistic, and required units to enforce sleep discipline.

ORGANIZATIONAL FACTORS

The organizational factors of firepower, mobility, and communications favored the divisional engineers in a direct support role. The squad organization, using the armored personnel carrier, was superior to the combat heavy battalion's functional organization using wheeled vehicles. Although D-8 dozers and big scrapers were a welcome addition to the division area of operations, most of the commercial equipment severely lacked cross-country mobility.



Maintenance support during the exercise revealed the criticality of operator proficiency. A good operator could prevent equipment break-downs as well as make minor on-site repairs. Mechanics were in much demand and spent much of their time in-transit.

For engineer work to be timely, a basic load of Class IV materials must remain combat loaded. However, the effectiveness of the materials carried depends on familiarity with the terrain and thorough prior planning.

Direct support is needed to allow engineer assets to be easily readjusted on a need basis. Yet it is a two-edged sword, since it requires internal resupply. There were times when engineer platoons were extremely difficult to locate. Mobile warfare often requires the maneuver commander to provide Class I, III, and V materials to engineer units less than company size. If the requirement is anticipated, prior coordination will preclude the problem.

CONCLUSIONS & IMPLICATIONS

Two principal conclusions can be drawn from the GALLANT CREW 77 experience. First, it is possible to fight outnumbered and win. However, to accomplish this feat on the modern battlefield, it is absolutely essential to maximize the potential of the combined arms team. Combat engineers must constantly train with other team members to maximize the team effort.

Second, the employment of a combat heavy engineer battalion in direct support of a division has certain disadvantages. The battalion organization lacks foxhole strength, communications, and vehicular mobility. Furthermore, the requirement to maintain construction skills severely limits the training opportunities for the direct support mission. The combat heavy battalion is better organized and equipped to perform area and task missions. The non-divisional combat engineer battalion, TOE 5-35, is better suited for the direct support mission by organization as well as by personnel.

The modern battlefield will greatly strain the command and control capability of the divisional engineer battalion. Organic assets, as well as non-divisional engineer units, will be working in a large division area of operations, requiring increased coordination and liaison by the Assistant Division Engineer section. If an engineer task force is created, officers from the divisional battalion will be required for the task force headquarters.

With corps and division commanders concentrating the forces and brigade and battalion commanders controlling and directing the battle, what is the role of the engineer group headquarters? Many group assets will be under the control of division engineers. If the divisional battalion is not authorized additional personnel, will the group headquarters be able to furnish officers to temporarily assist several division engineers? If so, it will be a type of assistance not traditionally furnished by an engineer group commander.

Deliberate river-crossings require technical expertise by all combat engineer units, not just bridge units. Do we train enough today so that we are prepared to implement tomorrow?

If the GALLANT CREW 77 experience can be reliably extrapolated to the future battlefield, engineer mission performance will depend more on the mobility and the survivability of the engineer squad, not the earth hauling capability of a dump truck.

Major Joseph P. Kish wrote this article to satisfy a requirement of the Armed Forces Staff College Research Program. He is currently assigned to Headquarters, USAREUR & 7th Army.

One Station Unit Training — *Engineer Style*

Brian Porr

From Bunker Hill to the jungles of Vietnam, engineer soldiers have been on the front lines—laying mines, building fortifications, bridging gaps, and sometimes defending themselves in close combat.

In the proud tradition of yesteryear's "sappers" and "pontooners," combat engineer trainees at Fort Leonard Wood, MO, are perfecting the One Station Unit Training (OSUT) concept.

FIRING THE M-60

OSUT testing began at Fort Leonard Wood in late 1975 when two Combat Engineer Advanced Individual Training (AIT) companies participated in a revolutionary 14-week entry level training program. The results of the test pointed overwhelmingly in favor of instituting OSUT on a much wider scale. Shortly thereafter, the 2nd Training Brigade was converted to the OSUT configuration.

Trainee insecurity and the high cost of moving trainees from one station to another during their initial training were key factors favoring conversion to OSUT.

The original OSUT program merely combined Basic Combat Training and Advanced Individual Training into one cycle of 14 weeks duration with an obvious point of transition from the former to the latter after the sixth week of training. Due to the special nature of Combat Engineer training and the motivational requirements for new engineers, the two distinct programs of instruction gradually merged into the completely integrated OSUT program of today.

By eliminating repetitive training and adding a comprehensive review of course content, the total training time was reduced to 12 weeks, thus saving the Army two weeks per trainee. All combat engineer training previously conducted as AIT is included. However, various subjects are now taught throughout the 12-week cycle. Every effort is made to provide new soldiers with continuous motivation and identification in their role as combat engineers.

The new program has resulted in better trained combat engineers for several reasons. The retention of all subject matter is generally better, since subjects are taught, reinforced, reviewed, and tested continuously throughout the cycle. And since drill cadre have a longer period during which to observe trainees, more accurate identification and separation of unacceptable personnel is accomplished. Marginal soldiers are brought up to standards or separated much more effectively in the longer cycle than in the short BCT/AIT cycles. The retention rate for OSUT trainees is five to 10 percent greater than the retention rate for either Basic Trainees or AIT students.

OSUT trainees are better motivated than BCT and AIT trainees because they are exposed to combat engineer skills and tasks from day one of the OSUT cycle. Drill sergeants in the program are combat engineers, themselves, and they're present for nearly all training throughout the 12-week cycle. Thus, trainees develop confidence in them and rely on them to provide the answers to many of their questions.

Early in the first week of OSUT, trainees receive a class on the role of combat engineers. During that class, many young trainees receive a rude awakening, for they're reminded that combat engineers work with hand tools, not heavy equipment. They begin to realize that the tasks they'll be expected to perform in the field is often dirty, back-breaking work. They soon find out that training is geared to basics. If a trainee learns the basic skills at Leonard Wood, he can build upon those skills once he reaches his first permanent duty station.

During subsequent weeks, trainees are exposed to demolitions, map reading, tools, and rigging. At the same time, they're learning basic military skills familiar to every soldier: basic rifle marksmanship, road marches, drill and ceremony, military justice, and physical training. Subjects are spaced to maintain a high level of interest among trainees.

On the last day of the seventh week of training, each OSUT unit conducts an "all trainee" ceremony, including a short parade. All leadership positions during the ceremony are manned by trainees. The unit is awarded an Essayons streamer for its guidon, symbolizing the completion of the first half of training. Each individual who has met all training requirements to that point is allowed to wear the Engineer Castle on the pocket of his uniform for the remainder of the cycle to identify his achievement.

EMPLACING A CLAYMORE MINE

After completing landmine warfare training in the eighth week, the mobility phase of instruction begins. Trainees learn bridging, tactics, and other subjects to aid in the movement of friendly forces during the next three weeks.

The highlight of the entire training cycle is Engineer Week, a week-long tactical field training exercise conducted during the eleventh week of training. In order to make the training as realistic as possible, each unit is fully equipped according to TO&E specifications. Activities during Engineer Week include bridging, minefield construction and destruction, demolitions, and participation in the live fire assault course, the combat engineer defensive exercise, and the strongpoint assault course.

Engineer Week reinforces training previously received, further instills an appreciation for the mission and role of the combat engineer, and provides a logical transition from training into a TO&E unit. The tactical exercise incorporates all aspects of training into a comprehensive review and awareness package, and for the first time trainees are able to apply the knowledge and skills they have learned.

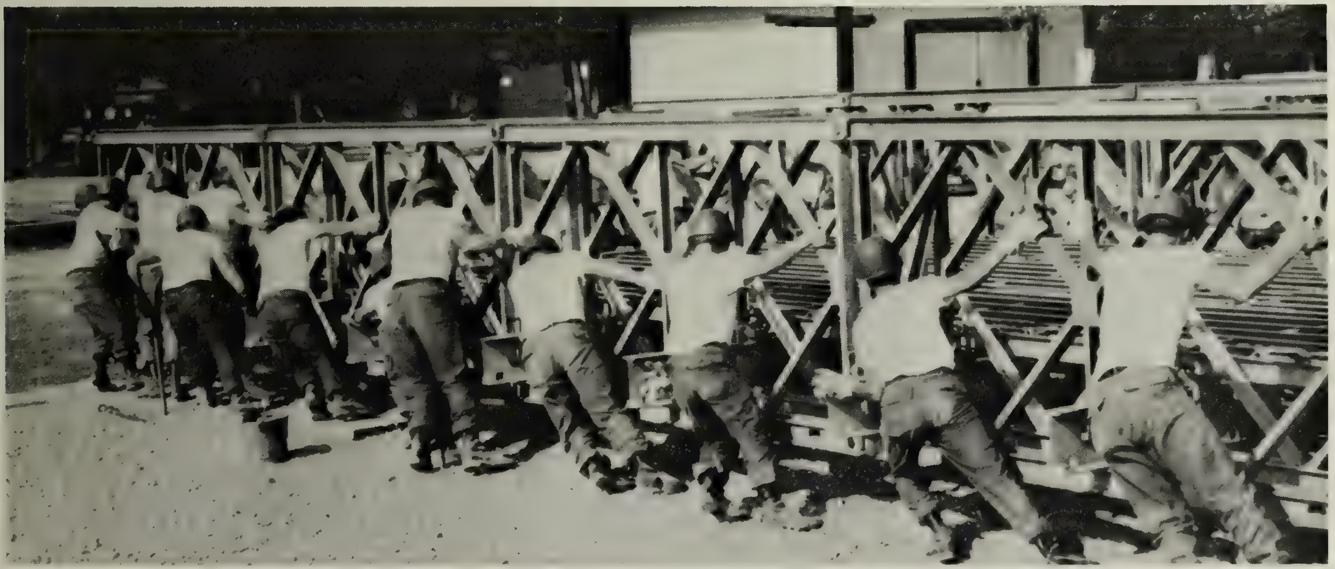
Graduation from OSUT takes place during the twelfth week of the cycle with a formal ceremony, complete with a sound and slide presentation of the history of combat engineers. Every trainee graduate has the Corps of Engineers Castle pinned on his collar by the drill sergeant with whom he has worked most closely during the previous 12 weeks.

More than 21,500 trainees have graduated from Engineer OSUT since early 1976. They bear little resemblance to the raw recruits who arrive daily at Fort Leonard Wood, scared, out of shape and confused. Engineer OSUT is a demanding course which smooths, polishes, and matures young men and women. Although graduates of Engineer OSUT are not complete "sappers" or "pontooners," most have mastered the basics and will readily assimilate additional information and skills in their first permanent units.

They have earned the privilege of wearing the Castle and can state with pride, "Essayons,"—Let Us Try.

Mr. Porr held the rank of Captain and served as the Operations Officer of the 2nd Training Brigade at Fort Leonard Wood, MO., when he wrote this article. He is now a civilian residing in Sherman, TX.

NEGOTIATING THE CONFIDENCE COURSE



EMPLACING A PANEL BRIDGE

Engineers Restore Paradise Lost

Colonel Edgar J. Mixan

The mention of tropical islands usually conjures up visions of swaying palms, gentle breezes, and leisurely days on the beach. But life on the string of 40 islands which make up Enewetak Atoll has never been easy.

The atoll's original inhabitants endured a constant fight against the elements; United States Marines charged through the withering fire of stubborn Japanese defenders to capture the atoll during World War II; and from 1947 to 1958 Atomic Energy Commission personnel endured a lonely, isolated existence there while conducting 43 nuclear tests, including the first hydrogen bomb explosion.

Today, almost 20 years after nuclear testing ended on Enewetak (previously spelled Eniwetok), American military and civilian workers have returned to restore this tropical paradise lost for approximately 450 dri-Enewetak (pronounced dree) who were relocated when testing began.

A part of the U.S. Trust Territory of the Pacific Islands, Enewetak is in the Marshall Islands, located roughly halfway between Hawaii and the Philippines.

The three-year reclamation project began in June 1977 when a Joint Task Group of U.S. soldiers, sailors, airmen, and civilian scientists and engineers descended upon the deserted island chain. Under the direction of the Defense Nuclear Agency (DNA), the 900-man task force was spearheaded by the 84th Engineer Battalion, U.S. Army Support Command, Hawaii.

The project was designed to progress in three phases—mobilization, cleanup operations, and construction. Military participation was limited to the first two phases, after which the Department of the Interior will take over. Cleanup operations are expected to continue until October 1979.

MOBILIZATION

The most immediate problems facing planners of the operation were the site's remote location, the lack of adequate housing facilities on the atoll, the need for specialized equipment, and special coordination requirements of a joint activity.

A design team in the 84th operations section prepared the bill of materials for the Lojwa base camp and the encryptment operation on Runit Island. Unit personnel who were designated to execute the construction were included in the planning phase to insure the complete coordination of the operation.

Special equipment which had to be procured included seven ready-mix concrete transit trucks and a concrete pump to be used in the tremmie operation for disposal of the contaminated soil on many of the islands.

Major housing construction was concentrated on Lojwa since the tiny island was occupied only by rats, scrub, and a collapsing tin shed. The Army Functional Components system was used as the basic planning document for the 500-man camp, but due to strict time limitations, it became necessary for staff officers to draw up the bill of materials for local purchase and delivery by contract. Some of the building designs were also modified to fit the special requirements of the work group.

The 84th Engineers actually lived in tents while they built their own camp from a mountain of timbers and corrugated sheet metal delivered to the beaches of Lojwa. Rising to the occasion, they seemed to thrive on hardship while developing into a determined, high-spirited team.

"It's difficult to realize how much work an engineer battalion can do and the teamwork it can develop until you move it away from the petty problems and irritants of garrison life and give it a real mission," noted one young company commander.

Just being on Enewetak requires acclimation, for it's a shoulder-to-shoulder existence. About half of the work force is housed on Enewetak Island and the other half on smaller Lojwa. The northern base camp at Lojwa is a city of open-air, open-bay metal huts and outdoor showers. On Enewetak, however, most of the troops and civilian workers live in a multi-storied, air conditioned concrete dorm, where they share four-man rooms.

One problem peculiar to Enewetak is the proximity of the islands to one another. They are scattered around a lagoon which measures 23 miles at its widest point. Thus, transportation of men and equipment from living and storage areas to work sites has been a major chore in itself. For example, a 21-foot open boat carrying the mail clerk from Enewetak to Lojwa got turned around one day in a rain squall. Ten hours later he was found heading for New Guinea.

CLEAN-UP OPERATIONS
ON MEDREN

MOVING OUT TO LOJWA FROM ENEWETAK

But in the true tradition of Army engineers, innovation and ingenuity have solved most problems. For example, engineers set up a makeshift shop on Enewetak using home made jigs and commercial saws to mass produce roof trusses in lieu of building them piecemeal at each work site.

Innovation also surfaced in the application of corrugated siding to wall panels. Unit commanders discovered that much time could be saved if siding was applied prior to, rather than after, erection of panels.

Another time-saving innovation involved the salvage of an abandoned ready-mix concrete truck from the scrap heap left from the nuclear testing period. Since the truck had no motor, it was pulled by a five-ton truck from slab to slab and charged with a jerry-rigged conveyor from a rock crusher. As awkward as it sounds, the unit significantly decreased pouring time that would have been necessary using only the standard 16S mixers.

Electrical power to operate all facilities and equipment on the atoll was provided by the Army's Facilities Engineering Support Agency, which deployed, installed and put into operation a 2,000-kilowatt power plant. The logistical problems encountered in operating a power plant of such size in a remote location have proven to be valuable training for future military contingency missions.

CLEAN-UP OPERATIONS

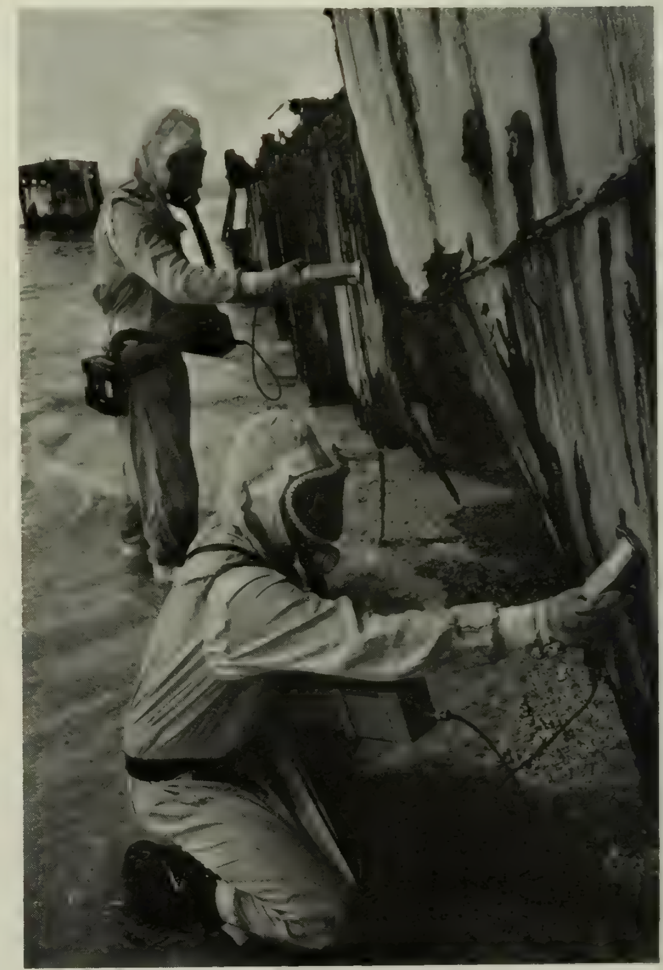
Hundreds of tons of debris are scattered over the northern islands and traces of radioactive fallout from the past can still be detected in much of the soil. Countless hulks of decaying landing craft used by the Atomic Energy Commission to move men and equipment during the testing period are aground on lagoon beaches. And rusting, metal ghost towns, once teeming with AEC scientists and technicians, stand on the atoll's southern rim.

But, little by little, these mute monuments to the early days of nuclear testing are falling to the dozer blades of the 84th Engineers. And the radioactive soil and debris is gradually being removed and deposited at the bottom of Cactus Crater, a huge crater on Runit Island left by Test Shot Cactus.

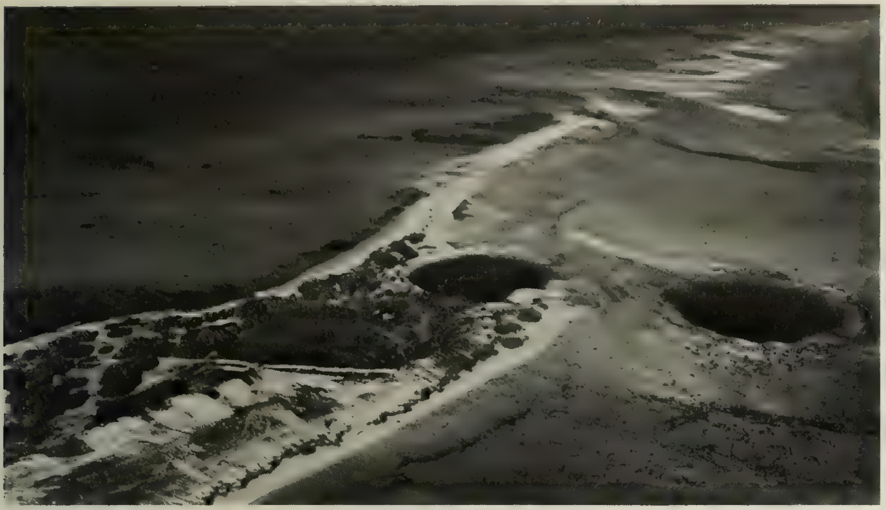
Army engineers have had to learn new techniques in the removal of soil and vegetation from contaminated sites. Heavy equipment operators were retrained to remove soil in lifts as small as six inches. They have to work slow and take small bites in order to minimize the amount of contaminated dust in the air. Vegetation removal has been accomplished with minor soil disturbance by connecting a 200-foot anchor chain to two D8 dozers and dragging it through the scrub. Machetes are used in areas where dozers can't operate.

Collection of the contaminated soil is one problem and disposal is another. Navy causeways or landing craft transport Army dump trucks carrying the soil to Runit Island, the site of 18 nuclear explosions. There the soil is stockpiled and eventually mixed with cement and a type of bentonite to increase adhesion.

The mix is then loaded in the ready-mix transit trucks, mixed with water, and moved to the tremmie site. From that point, a pump forces the mix under pressure to a barge anchored at the center of the crater, where it is deposited 36 feet under water on the crater floor.



DECON TEAM AT WORK



CRATERS CAUSED BY NUCLEAR EXPLOSIONS ON RUNIT ISLAND

When all contaminated soil has been removed from the islands and placed in the crater, an 18-inch concrete cap will be placed over it as a seal until the radioactive materials decay to safe levels. That is expected to take approximately 26,000 years.

Justification for U.S. participation in the clean-up is derived from our agreement as Trust Territory administering authority to protect the dri Enewetak against loss of their land and resources, and to a commitment to return the atoll when it was no longer needed.

The people of Enewetak are glad to be going home. The first group of 50 returned to Japtan Island, on the southern rim of the atoll, in March 1977. Chief Johannes Peter, their 84-year-old, gravel-voiced chief, said at that time "It is very sad to see what has happened to our islands, but we are home now and we are happy."

Since their return, the dri Enewetak have survived mainly on fish they catch in the lagoon and basic staples delivered by ship. They spend most of their time clearing brush and nursing a few frail pandanus and breadfruit seedlings, which will not be productive for another five or six years.

Eventually, the Department of Interior will build homes on Japtan, Medren, and Enewetak and replant other islands with more breadfruit, pandanus, coconut, and other crops. But it will be years, if ever, before life on Enewetak returns to a semblance of what it used to be.

MILITARY BENEFITS

The development of leadership skill is the primary benefit to military personnel involved in the Enewetak project. Junior officers and non-commissioned officers have a unique opportunity to use their initiative and resourcefulness to solve basic engineering problems in an environment similar to that which might be encountered in a future war zone.

Platoon leaders, in addition to their normal duties, must coordinate activities of Navy boats, Army landing craft, helicopters, and radiation survey teams. They must alleviate the fear of radiation by subordinates. They must make simple, yet critical, decisions. They must make the best use of equipment in a unique environment. They must be alert for changing situations. They must be firm, yet remain flexible in their position of leadership. The job is tough and demanding, the standards high. But we are meeting the challenge.

Colonel Edgar J. Mixan was the Joint Task Group Commander during the first year of the Enewetak Clean-up Project. He is currently assigned as Commander and Director of the Facilities Engineering Support Agency, U.S. Army, Fort Belvoir, VA.

CHIEF JOHANNES PETER

Assault Breaching

The key to closing with the enemy

Major Michael L. Viani and Major Peter D. Knight

"The best defense is a good offense" not only in football, but in warfare too.

Is the U.S. Army capable of conducting the type of offense necessary to win on the modern battlefield? The active defense requires an offensive capability to whittle the enemy down to size both by fire, and by fire and maneuver. However, it is not enough just to stop the enemy advancement. We must then be able to mount an offensive against him.

Mobility is essential to a successful offensive, but it is not guaranteed by mechanization. Mobility also depends on the ability to breach obstacles, which is, itself, dependent on the following three factors:

1. Doctrine, which must include tactics and drills that enable us to plan ahead for the control and execution of assault breaches.
2. Equipment, which must provide the capability to quickly breach all types of obstacles and be placed in units so that it is readily available when needed.
3. Training, which must be practiced at all levels, utilizing all components of the combined arms team.

Once the enemy attacks, we are not necessarily going to hold ground. Instead, we will utilize the ground to our advantage so that our fire and maneuver capability can be used to attrit the enemy, thus giving us the time to concentrate our forces against his commitments. Throughout the battle we intend to counter-attack not necessarily his front, but his rapidly developing flanks deep into what is becoming his rear.

Historically, the enemy has been able to very quickly organize strong, hasty defenses. Obstacles are an integral part of his defenses. We should not discount the enemy's ability to use dynamic mining to strengthen his defenses and protect his flanks. He can lay conventional mines by armored vehicles and helicopters, and may be developing more sophisticated mine systems. We also must expect our counter-attacks to encounter obstacles that we originally executed.

Current U.S. offensive doctrine stresses the hasty attack, which includes armored forces maneuver and outflanking enemy positions, by-passing obstacles and, in general, maintaining the momentum and initiative of the attack. The deliberate attack is conducted only when the attacking force encounters an enemy defense in depth. Doctrine implies that obstacles are really only a problem in a deliberate attack, but the ability to by-pass all obstacles in the hasty attack is doubtful.

THE BREACHING PROBLEM

As our preoccupation with the techniques of defense diminishes, a realization of the breaching problem grows. Although many arguments have been made, the overall goal is to maintain the breaching operation as an integrated combined arms effort utilizing many options. Giving the problem to the engineers would probably mean that they would have very limited resources (unacceptable in terms of the mobility of our attacking forces) or that the engineers' organization would dramatically increase (an unlikely increase in authorization and funding).

HAND BREACHING BY THE INFANTRY

AN OVERVIEW OF CURRENT DOCTRINE

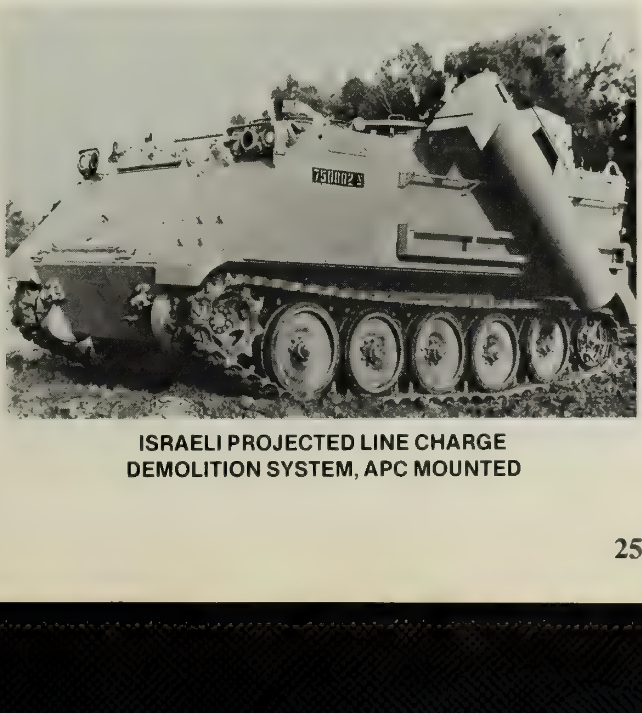
Doctrinally, there is scant consideration given to breaching at this time. FM 90-7 (Obstacles) and FM 5-100 (Engineer Combat Operations) do address the problem, but in a general manner. The drills and combined arms immediate action techniques necessary to insure the success of the attack have not been detailed. The same applies to FM 20-32 (Mine/Countermine Operations at the Company Level). Significantly, FM 71-100 (Brigade and Division Operations—Draft of May 1977) barely mentions the subject and FM 71-2 (Tank and Mechanized Infantry Battalion Task Force) has less than two pages devoted to the subject. There is no discussion of how to establish and control a breaching force, where the necessary equipment comes from, or how to execute a successful breach. There is no development of drills designed to save time and lives when obstacles are encountered unexpectedly.

FM 71-1 (The Tank and Mechanized Infantry Company Team) has more detail but only in regard to hand breaching by the infantry. FM 7-20 (Light Infantry Battalion) plays through a Brigade deliberate attack scenario, with little mention of breaching requirements. FM 90-3 (Desert Operations) details a method of attacking a strongpoint which does consider the problem of breaching, but it is vague, does not get into the "how to," and only considers hand breaching. TM 5-220 (Passage of Obstacles Other Than Minefields) was last published in 1958 and requires much updating.

Much can be learned from other armies. The Israeli Army, in particular, has highly developed and detailed doctrine designed to enable their combined forces to efficiently conduct assault breaches. The British and Germans have approached the problem in a similar manner as have the Soviets. Forethought, detailed planning and preparation are the keys and each member of the combined arms team must thoroughly understand the role it must play.

EQUIPMENT AND TRAINING STATUS

If we needed to conduct an assault breach today, what equipment would be available? We have AVLBs, tank



ISRAELI PROJECTED LINE CHARGE DEMOLITION SYSTEM, APC MOUNTED dozers and CEVs to assist in the reduction of gaps, blockades, and bunkers. We have line charges, either towed behind or pushed ahead of tanks, to breach lanes through minefields. However, we have no positive armored means of locating the forward edge of a minefield—a critical deficiency. If the forward edge of the minefield cannot be located, line charges may be placed and detonated at the wrong point in the approach. Since each charge varies from only 70 to 90 meters in length, the problem should be obvious.

Only two methods of locating the forward edge are available today: bulling through—which is very hazardous to armored crews; and with the use of detectors and probes by dismounted troops—which is very hazardous to troops and very slow. In essence, the rate at which we opened routes in Vietnam against purely nuisance mining would be faster than the rate we could expect in a conventional war. Is such a rate acceptable for the speed of the hasty attack? The obvious answer is NO.

Because of the deficiencies in doctrine and equipment, training cannot be considered fully effective.

NEW DEVELOPMENTS IN DOCTRINE

After discussions between the Engineer and Armor Schools during early 1978, the following proposals were submitted by the Armor School:

— One tank per tank platoon would be fitted with a mine plow;

— All tanks would be fitted with hard points to accept the mine roller;

— Each division engineer line company would carry three mine rollers per supported tank battalion and armored cavalry squadron;

— Line charges would be carried by the engineers;

— Development of an improved line charge (probably a Giant Viper version) would be continued to provide a better capability. (All line charges would be ordered as needed, but each engineer company would carry a basic load.);

— Continued development and testing of SLUFAE.

BRITISH GIANT VIPER IN ACTION

The Armor School's proposals are a positive step, but the jury is still out on many details. If and when they are implemented, it would mark a real breakthrough in U.S. breaching capabilities.

Just consider the possibilities. A tank heavy force moving to contact would be able to maneuver its elements so that one lane per tank platoon could be made with organic battalion means. Any area suspected of mining would require only minor shifts to employ breaching assets to that point. The engineer elements accompanying the leading maneuver task forces would be organized for more extensive breaching and other mobility tasks. Specifically, mine rollers and a supply of appropriate line charges would be carried forward in the column. These would be employed when necessary, but most definitely during the deliberate attack. SLUFAE and additional engineers would be positioned to breach additional lanes as the assault is completed.

Such an approach would help solve the breaching problem for armored columns, but it must be remembered that no single type of equipment can be a panacea, for each has its limitations. But what about the strongpoint, which is specifically designed to be "unbypassable," and requires extensive infantry effort to dislodge the defenders? In such cases, the classic procedure is to cross a light force to seize the objective, then reinforce with heavy weapons as soon as possible.

How will we best get the light forces on the objective? The use of air assault is most innovative. Because of the enemy's massive air defense umbrella, such a deliberate attack would be proceeded by intensive counter air defense fires, coupled with normal artillery preparation and direct fire suppression. These fires would lift to allow the air assault to be made onto the objective. The assaulting troops would be equipped to kill tanks and other armored vehicles at close range, neutralize troops in bunkers, and engage the enemy in close combat. While direct and indirect fires and smoke are placed about the objective to isolate it from its mutually supporting threat positions, breaching forces would open lanes to move heavy weapons and tanks onto the objective.

EQUIPMENT REQUIREMENTS

Pressure on equipment development should not stop until all necessary items are in the field. Even then, research and development must continue in order to preclude another 30-year stagnation in the field. The mine plow and roller are most likely to be fielded first. One problem with the roller lies in its storage, transportation and rapid mounting. Because of its weight, bulk, and criticality, the mine rollers must be issued with a dedicated prime mover. A twenty-five ton low bed trailer could probably be fitted to carry two rollers nested and capable of quick connect. A lifting device may be required and thus included. Additional low beds should then be authorized for each company carrying rollers. To insist that the company assume the extra equipment without additional transportation would dramatically lower its mobility. (Low beds have limited mobility off-road, so another alternative should be investigated.)

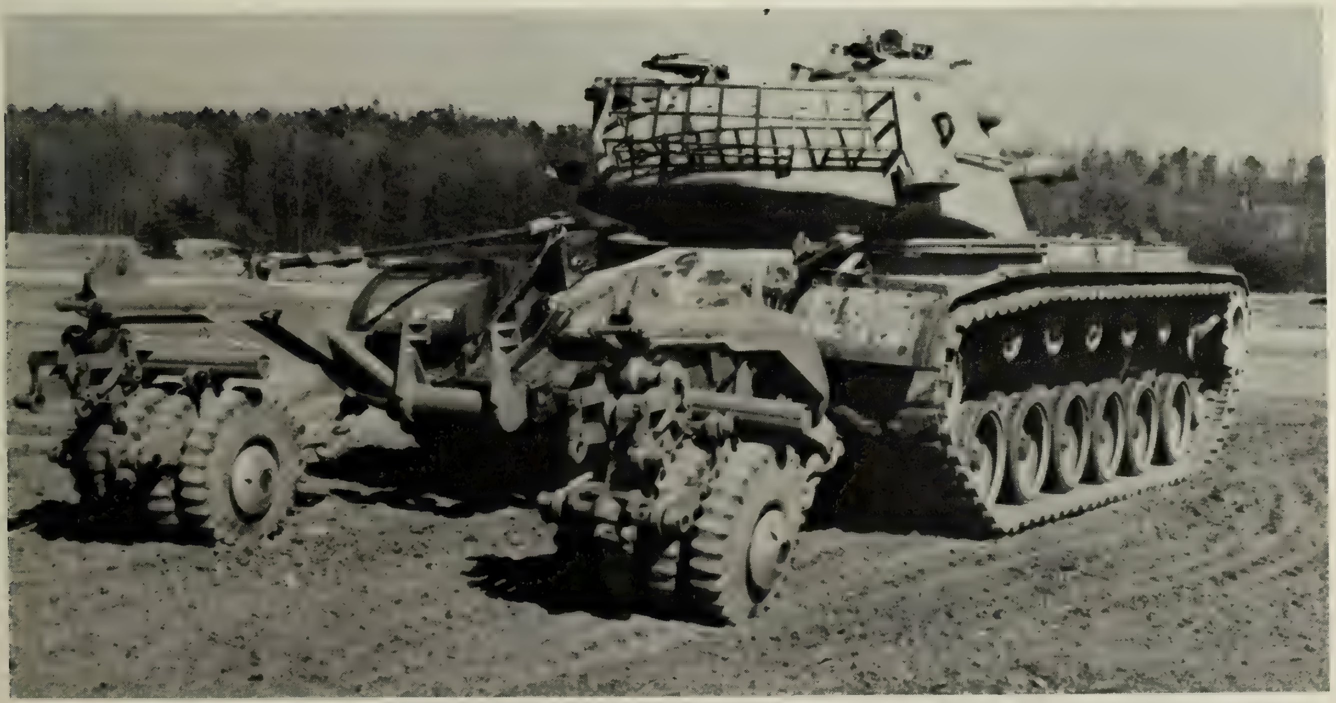
Line charges must either be fitted to tanks or APCs, or towed behind them without unnecessarily limiting their mobility. The charges must be armed and launched from within a closed vehicle. The Israelis have such operational capability and the Warsaw Pact Armies have something similar. Training charges are needed to allow the practice of transportation and deployment in breaching exercises. SLUFAE also should come with dummy rounds, so that loading and firing can be practiced.

TRAINING PHILOSOPHY

In the training for these tasks, we should not be misled into thinking that the technical aspects of setting up and firing a charge or manipulating the plow or roller are enough. Nor is the exercise in which engineers play all roles of the attacking force. Training exercises must be built around the combined arms team, but need not be lengthy. In fact, initial exercises should be repeated over varying terrain and situations, much like a football team practicing offensive plays prior to a scrimmage. A maneuver brigade could practice these vignettes locally in a series of one-day exercises. It is vital that the question of breaching not be begged off by calling for the engineers to do all things.

In summary, we must insure that in the area of breaching we obtain the proper equipment and train in the proper way, making necessary allowances of time, equipment, personnel and logistic support. Although the sweeping flank maneuver is more glamorous, we must be fully competent in performing the more essential mission of closing with the enemy.

Major Michael L. Viani is currently assigned as Chief of the Tactics and Operations Division, Department of Combined Arms, Directorate of Training, USAES. Major Peter D. Knight, a member of the Royal Australian Engineers is currently serving as the Chief of the Advanced Tactics Branch, Department of Combined Arms, Directorate of Training, USAES.



U.S. TANK PUSHING SOVIET PROTOTYPE ROLLERS

A Bridge Too Long

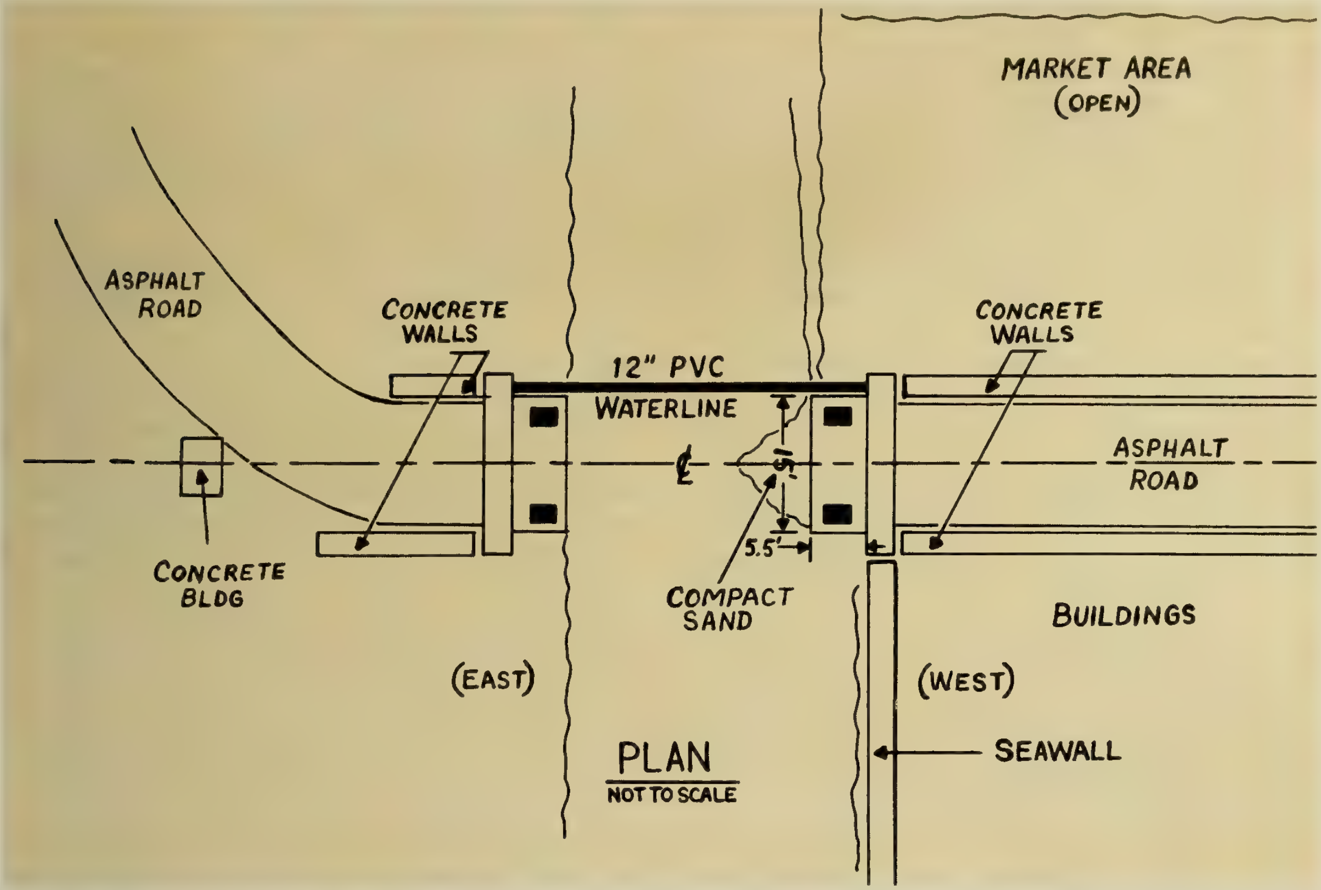
Major Harvey Q. Ramsey

History is filled with uniquely designed and constructed Bailey bridges. The versatility of this unique equipment is legend. For almost four decades, the Bailey has been the backbone of the military engineers' bridging inventory. It has been built as single story, multistory, partial story, underslung story, suspended, floated, cantilevered and cable reinforced. From this perspective, the 170-foot triple single Bailey bridge built at Cap Haitian, Haiti earlier this year is not particularly unique. But considering available skills and equipment in backward, subtropical Haiti, the bridge takes on the aura of a much larger accomplishment.

Cap Haitian is Haiti's second largest city and the only port of any consequence on the north shore. As such, it serves as a commercial center. On 21 August 1977, a 79-year-old French-built bridge collapsed in the center of Cap Haitian, severing the city's major route of economic intercourse.

An American engineer under contract to the U.S. Agency for International Development (USAID) saw the Bailey bridge as the solution to the problem. Through his experience as an engineer officer during World War II in Europe and in Korea, he was aware of Bailey bridge capability. If, in his zeal, he erred relative to the bridge design and construction requirements dictated by the site, he should not be condemned. The situation was critical and an immediate solution was considered necessary.

One set of Bailey, along with selected erection equipment, was ordered by the Republic of Haiti from excess U.S. property. Shortly thereafter, the American engineer from Haiti arrived at Fort Belvoir for a "brush-up"



class on Bailey bridge construction. It was to be a rather simple project; 150-foot gap, MLC 8 bridge placed on the existing abutments. He was given about 12 hours of instruction, a preliminary bridge design, and the necessary construction manuals. Carrying with him expressions of envy about "wintering" in the Caribbean, he returned to Haiti.

Messages requesting a two-man Army mobile training team began almost immediately, waxing and waning through the holiday season of 1977. When Major Harvey Ramsey and Sergeant First Class Richard Pattin were dispatched from Fort Belvoir in late January 1978, they envisioned a two-week holiday with pay in the warm Caribbean sun. As always, it just didn't work out that way. What they expected to be a four-day build and a ten-day "inspection" wound up as 21 consecutive days of construction.

Upon their arrival in Haiti, Ramsey and Pattin were immediately impressed with the high level of political interest in the project. Cap Haitian was in economic agony and its pain was being felt across the total political spectrum. The Minister of Public Works was under pressure and he was pressing hard on the USAID engineer staff which had promised help. The supporting bureaucracy had been less responsive than USAID had hoped, causing delay, revised estimates, and a concomitant loss in credibility both to the Haitian and U.S. officials. Continuing bureaucratic frustrations had acted to intensify expectations, reduce discussion, and raise tempers. What was anticipated to be a relatively anonymous, low-level project had escalated to visions of a grandiose ribbon cutting ceremony by the President of Haiti and the U.S. Ambassador.

The initial feeling of casual confidence felt by the two-man team was shaken when they arrived at the construction site late on the evening of 25 January. The gap wasn't 150 feet, it was almost 163 feet, thus requiring a 170-foot bridge. To place a 170-foot bridge on the existing abutments required the construction of 180 feet of bridge. A quick reference to the Bailey Bridge manual confirmed no design criteria for 170 feet of bridge, to say nothing of 180 feet.

The approaches to both shores were fills and bounded by a masonry wall which constricted the construction site. Both fills were sloped at an angle of five percent, causing problems in site layout, construction, and removal of the launching nose. The extended centerline of the bridge on the near shore ran directly through a new office building constructed for the local police. The city's main water supply, a semi-suspended 12" PVC pipe, was immediately adjacent to the bridge site.

The bridge itself was stored rather haphazardly about a quarter mile from the site. To move it to the far shore and construct from west to east would require almost a week. The only equipment available was a 3,500 pound forklift and a compressor with pneumatic hammer. A front loader and crawler tractor were promised. Hand tools and equipment, available in limited quantity, were individually owned and in varying states of disrepair.

To compound the problem, the bridge was delivered with an inadequate number of plain rollers and stringers, and neither four-inch nor six-inch grillage came with the bridge. The only grillage available was a hodgepodge of hand-sawn timber of varying width and depth, unique only because of its lack of uniformity. The team chief was surrounded by a milling throng of unskilled but enthusiastic workers who were without leadership and who had never seen a Bailey bridge. He threw his preliminary design into the river.

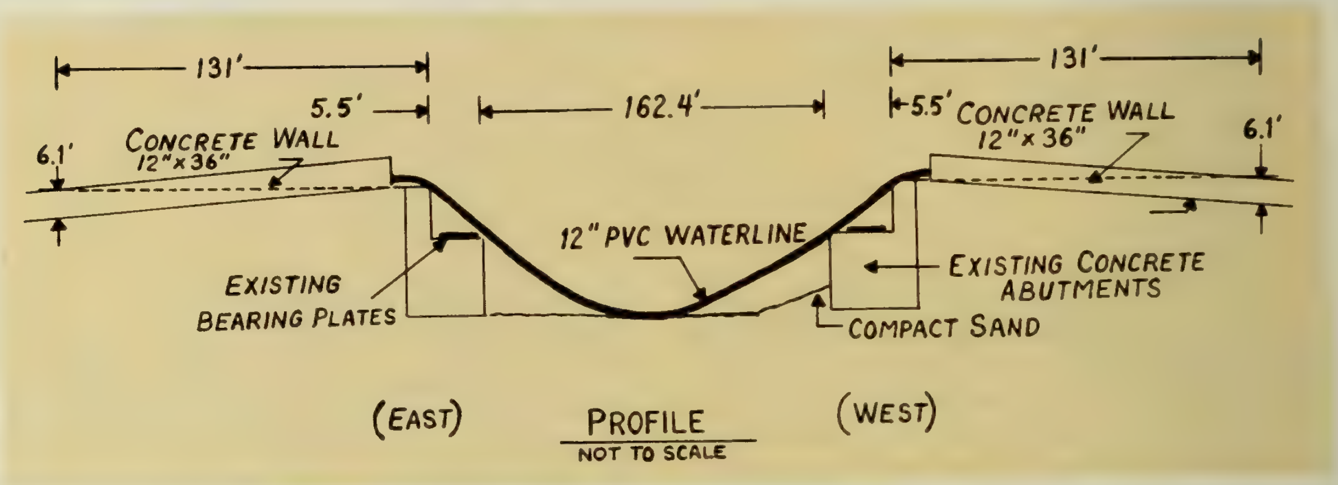
The next day, 26 January, was one of decision. Considering available equipment and site conditions, perhaps the bridge should not be constructed. The initial mistake in measuring the gap acted to reduce the class of the bridge from MLC 8 to MLC 4. Was the capacity worth the effort? Construction from east to west would require demolishing the police station. To build from west to east would mean a week's delay to move the bridge.

The team had brought a Bailey bridge film to be used in training the work force. Local interest in the bridge was obvious as a crowd of about 500 jammed into the theater to watch the 1945 Army training film. It was indicative of things to come when it was discovered after several false starts that the only available projector was designed to run backwards.

While the work force and other interested citizens reviewed the training film, the team chief conferred with local political officials and engineers. Their decision was predictable and almost immediate. The bridge must be built! Demolish the Police Station! Build from east to west!

Rocking rollers were placed immediately behind the end dam of each shore, producing a clear span of 177.12 feet. Since the span was well outside the design limits of the launching nose and bridge, as a safety measure, an additional set of rocking rollers was placed on grillage on the sand immediately in front of the abutment on the far shore. To provide the grillage, 10-foot towers had to be constructed from available timbers. This reduced the clear span to 167 feet. Tidal action in the river and anticipated high water due to rains upstream mitigated against moving this intermediate set of rollers closer to the near shore.

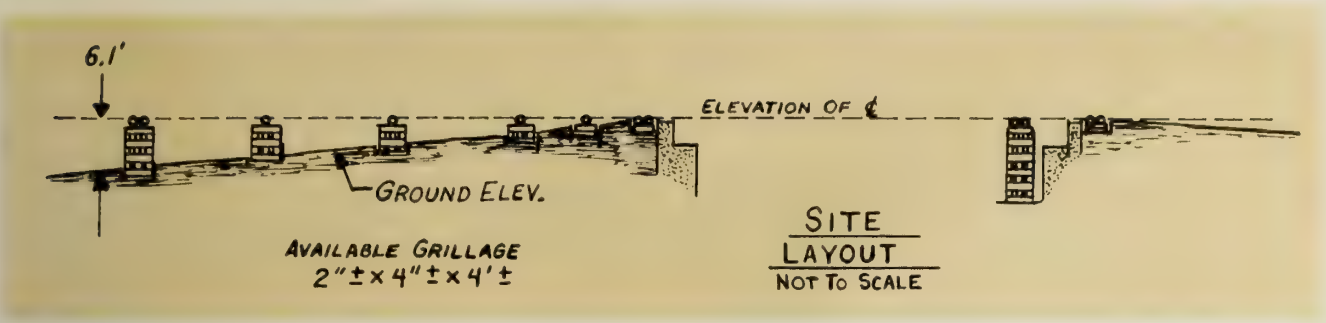
Only part of the site layout problem had been solved. Backspace required for 180 foot DD is 117 feet. Equipment constraints limited truss type to Triple Single. There was an excess of rocking rollers but a shortfall in required plain rollers. By using rocking rollers in place of plain rollers, and by removing construction rollers once the nose was complete, 100 feet of backspace could be provided. Additional counterweight was provided by using two bays of Single Single construction. There was absolutely no margin for error as every available panel would be used.



The launching nose design emphasized once again that the bridge was to be constructed on the outside limit of equipment capability. TM 5-277 made no allowance for a launching nose in excess of nine bays. Available equipment posed the same limitation. Given this limitation, where should the launching nose links be placed? Sag expected during launch over a span of 167 feet was 83 inches. Placing the links at 20 feet and 40 feet would raise the end of the nose 81 inches. If the links were placed at 30 feet and 40 feet, the end could be raised 94.5 inches.

The designer opted for placing the links at 20 feet and 40 feet and accepted the requirement to lower the far shore rollers by two inches. In actual practice, the point was moot because compression in the very high (10') grillage towers on the far shore necessitated constant jacking and adding of grillage.

The bridge was launched with the first 10 bays undecked. Additionally, the near shore was counterweighted to reduce problems of shear in the launching



SITE
LAYOUT
NOT TO SCALE

nose. Even this had to be precise to eliminate problems of panel deformation and negative moment. This counterweight had to be removed slowly as the bridge moved across the gap. In all respects, the design was outside normal procedures and relied upon safety factors designed into the bridge.

The inconsistency of the grillage required that every piece be selected in the fashion of a stone mason selecting stones for a perfect fit. Every two-inch layer had to be leveled and aligned. The height of the roller towers (six feet at the 100-foot point) magnified the problem. The entire process was compounded by an ebb and flow of dignitaries and onlookers who stumbled into completed roller towers and tripped over the centerline.

Construction began on Tuesday, 31 January. Although the Haitian workers learned quickly, individual ownership of tools, pride in capability, and limited supervision prohibited full use of the available labor. The launching nose was completed 1 February and Triple Single construction began immediately.

Triple truss construction was slow. Differential compression in grillage towers required constant jacking and releveling. The length of bridge and the problems of working outside the specified limits of equipment dictated that the launch be level. Construction was set back several hours when an overzealous worker put the security picket into the rocking roller while the bridge was still moving.

Progress was slow. The bridge had to be jacked up and the far shore roller height adjusted with every 20-foot advance. By the end of the day on 2 February, the bridge advance was completed and the launching nose had been removed.

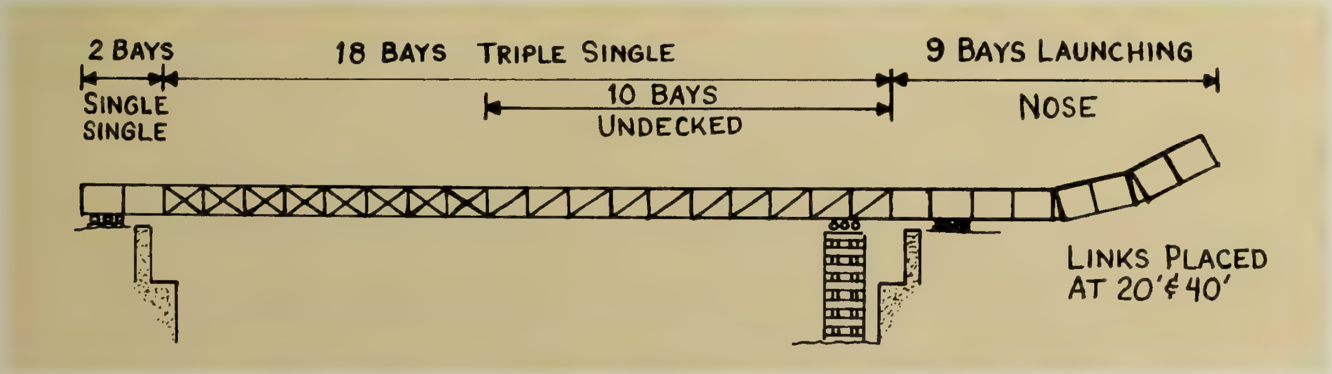
Plans called for the bridge to be jacked down the next morning. But, cranes to set the bridge on the abutments never materialized and the team had not considered the problems of jacking with the bridge and posts only 18 inches from the end dam of the abutment. They discovered there wasn't room for the jack handle to fit into such a restricted space.

It was decided to jack-up the bridge, remove the grillage, and jack the bridge back down. But as the bridge was jacked up, the grillage expanded back through the 10 inches it had compressed, making it impossible to change all six jacks from using the top to using the toe. The end dam had to be removed and the bridge jacked from the end post as originally designed.

Once the end dams were removed, the rest of the job proceeded smoothly.

As the moment of completion neared, the number of spectators increased. By late afternoon on 5 February, while final checks were being made, the crowd swelled to about 7,000, each intent on being the first to cross the bridge. The local Bishop was on hand to bless the bridge and the politicians anointed it with champagne before crossing in their cars. The last few minutes were tense, the speeches lengthy, and the crowd exuberant. It somehow seemed a fitting climax to a project that had been so close to failure so many times.

But even though the bridge was opened, its capacity was just too low to adequately support the traffic requirements. The Government of Haiti, with the assistance of USAID engineers, began planning immediately to upgrade the capacity. A number of solutions, intermediate supports, cable reinforcing and additional stories were considered. After much discussion, it was decided



to add a second story to the bridge, thus increasing it from a triple single to a triple double. Once again, assistance from the U.S. Army was requested.

Assistance came from Fort Leonard Wood in the form of First Lieutenant Joseph K. Schmitt and Sergeant First Class Larry A. Simmons. The job they faced was in many respects more difficult than the original construction.

Reinforcement in place began 27 June 1978 at the center of the bridge, center truss, and progressed toward each end. At first, the panels went in very easily, but, as more panels were added, work crews experienced difficulty with cord bolt and pin hole alignment. To remove some of the dead weight from the bridge, the riband, chess and plain stringers were removed. Only the button stringers were left in place with chess laid lengthwise on the stringers for safety purposes. That relieved some of the sag and allowed for easier assembly, but as construction continued, misalignment of cord bolt holes appeared again, causing work to be suspended. The only alternative was to construct a temporary intermediate pier.

On 28 June, the MTT returned on site to evaluate the possibility of building a grillage tower 45 feet from the far shore. Low tide revealed that the soil was firm enough to safely facilitate construction of an adequate pier in which the bridge could be jacked to assist in evenly distributing the load. The bridge was jacked to a height of approximately one-quarter inch from the bearings, thus eliminating more than six inches of sag from the bridge. Reinforcement in place procedures resumed, but again with an increase in sag.

Due to difficulty in aligning cord bolt holes at the near shore, it was decided that an additional temporary pier was needed to provide structural support and to relieve some of the compression load on the top members of the first story panels. A pier, constructed with panels and supported by grillage consisting of standard 6 x 6 timbers and bridge stringers, was constructed 15 feet from the near shore abutment. The bridge was jacked until the near shore end posts were approximately one-eighth inch off the bearings, reducing the effective bridge length to 110 feet.

The last panel of the near shore was inserted and pinned to the end post on 30 June. The bridge was jacked off the near shore towers and jacked down on its bearings. Work crews returned to finish construction at the far shore. The bridge was again jacked at the far shore grillage towers to help relieve additional sag due to the increase in bridge weight and tower settlement.

On 1 July, more than five months after initial construction began, reinforcement of the bridge was completed. The bridge was jacked from the grillage towers on the far shore, and both shore piers were dismantled. The stringers, chess, and riband were replaced.

The job was finished. The bridge was permanently reopened.

Major Harvey Ramsey is the Chief of the Combat Operations Division, Directorate of Training, U.S. Army Engineer School, Fort Belvoir, Virginia.

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NCO Channels

ENCOA

The spring and summer editions of THE ENGINEER carried articles dealing with the Engineer NCO Advanced Course (ENCOA). The articles were aimed at NCOs selected for attendance at ENCOA, providing information to help selectees prepare for the course. Information contained in the articles is still valid and copies of the articles are available from the Engineer School upon written request.

Anyone scheduled to attend ENCOA, or who just wants to know more about the course, may write to the Commander of the NCOES Detachment. He will give you a description of the course, and advice on how to prepare for the course.

Math and reading skills are still the biggest problem areas for ENCOA students. A 12th grade equivalency is recommended in both math and reading skills. The failure rate for ENCOA is approximately 10 percent. Some students arrive at Fort Belvoir with the idea that all they have to do is attend classes in order to graduate. Be advised that the course of instruction is not easy and no one is passed because of their good looks or sparkling personality. The offer of individual assistance to prepare for attendance at ENCOA is open, so take advantage of it.

PRIMARY TECHNICAL COURSE

The 12C (Brigade Crewman) Primary Technical Course (PTC) is conducted at Fort Belvoir. PTC is aimed at Skill Level 2 training and is SQT oriented. In the near future this course will be redesignated as a basic technical course (BTC) and aimed at Skill Level 3. The course trains personnel in Grades E4 and E5 for assignment in SL2 duty positions, but other personnel may attend with a waiver.

It is desired that personnel have a working knowledge of military tactical bridging prior to attending the PTC. The course is five weeks in length, and upon successful completion, graduates will be qualified in all aspects of tactical bridging.

The PTC uses the latest instructional methods. Training includes practical exercises and classroom instruction. Instructor-to-student ratio is usually about 1:5, and class size averages about 20. Intensive, individualized instruction is thus provided. A complete set of tactical bridging reference material is available to each student which he may keep upon completion of the course. Subjects taught include bridge classification as well as design and construction procedures on the following bridges: the M2 Bailey, MAB, M4T6 (Class 60 raft and fixed span), LTR, Ribbon and medium girder bridge. Instructor personnel are among the most highly qualified in the US Army and are willing to provide individual assistance to each student.

If you are scheduled to attend 12C PTC and need additional information about this excellent course, write to: CSM, US Army Engineer Course, Fort Belvoir, VA 22060.

12E ATOMIC DEMOLITION MUNITIONS COURSE

The Atomic Demolition Munitions Course taught at Fort Belvoir is a self-paced course designed to qualify personnel in MOS 12E10. Though primarily designed for entry level personnel, individuals reclassified or reenlisting for MOS 12E may also attend. Recent changes in the 12E course which will be of interest to ADM units in the field include the following:

- Reinforcement of timer calculation training using informal lecture and practical exercise with small groups of students in addition to the self-paced materials.
- All option mission, practical training exercises for small groups of students near the completion of the course.
- An all inclusive "end-of-course-test" used to detect and correct individual student weaknesses. (Emphasis is placed on quality and retention of training—not speed of completion.)

The ADM course is constantly being revised and improved, so comments from the field are welcome. Requests for additional information and questions or comments should be addressed to: Commandant, USAES, ATTN: ADM Branch, Fort Belvoir, Virginia 22060.

A note to personnel reenlisting for MOS 12E: remind your reenlistment NCO that a school allocation for the 12E course must be obtained manually. The automated system provides 12E school information for initial entry personnel only.

DEFENSE MAPPING SCHOOL

The Defense Mapping School (DMS) is located at Fort Belvoir and works closely with the Engineer School in developing Career Management Field 81. DMS is a component of the Defense Mapping Agency and is responsible for instruction in military cartography and related subjects. The school provides direct support to the Army, Navy, Air Force, Marine Corps and allied nations, with instruction and advisory services in the functional areas of mapping, charting, and geodesy. DMS conducts resident instruction in the following fields: surveying, cartography, graphic arts, topographic sciences and related subjects.

If your topographic unit has a training problem that might be solved by a Mobile Training Team (MTT), contact the Defense Mapping School. The point of contact should be the Director, Defense Mapping School, ATTN: PPO (MTT Coordinator), Fort Belvoir, VA 22060. Be prepared to outline your problem and state why you think a MTT might offer the solution.

If your unit is within CONUS, it's possible that assistance will not cost you anything. Assistance is available to reserve units as well as active units.

Officer Career Info

COLONELS

Physicals: Is your official personnel file up to date? Is there a copy of your latest physical in your official file? Paragraph 10-23c(4) of AR 40-501, including Change 29, states that officers 39 years of age and older should receive physicals in the birthday month of the odd numbered years of their age until they reach the age of 50 and thereafter annually. Lieutenant Colonels, Majors, and junior officers simply provide a copy to their MILPO for posting to their Officer Records Brief (ORB), but Colonels and Lieutenant Colonels (P) should have a copy forwarded for official filing and review by promotion boards. Critical items of note are profiles (three or more) and body weight and height.

Senior Service College: Eligibility for resident instruction in the Senior Service College extends through 23 years of active service, computed from the first day of September each year. Officers who have a basic service date between 2 September 1956 and 1 September 1957 are currently in their last year of eligibility. The board in session in August selected officers to start school in the Fall of 1979. Officers who are not selected for resident instruction should strongly consider applying for Nonresident instruction in accordance with AR 351-11.

MAJORS

Congratulations to those officers recently selected for promotion to Lieutenant Colonel AUS and those selected for promotion to Major RA. The files of those selected for LTC have been transferred to Lieutenant Colonel Tom Fisher in the Lieutenant Colonels Division for future actions.

Recent discussions with members of various selection boards revealed the following vital areas for Engineer officers:

- Officer Record Briefs (ORBs) are incorrect. Some items are correctable by MILPERCEN, but others must be changed through SIDPERS. Check with your MILPOs for corrections.
- Military Education Level (MEL): Completion of the Command and General Staff College by resident or non-resident instruction of great importance in consideration for promotion to Lieutenant Colonel AUS. When considering officers for assignments requiring MEL 4 schooling, there is no discrimination between resident and non-resident graduates.

CAPTAINS AND LIEUTENANTS

There have been some personnel changes in the company grades division. Lieutenant Colonel H. A. Froehle is the new chief and Captain Bob Melchior has replaced Captain Matt Dominy as the Lieutenants assignment officer.

The importance of having an accurate up-to-date ORB in your file cannot be overstated. It is critical for use in career management and selections for school and promotions. Pay particular attention to the height/weight ratio reflected. Regulations require an annual update of this highly visible element.

Photos are also important. Remember that you must have a photo taken upon promotion to first lieutenant and every four years thereafter.

Congratulations to the 231 lieutenants recently selected for promotion to captain. Selection rates for Specialty Code 21 was 90 percent. Your files are now managed by Major Mike Foster, same office, different desk.

WARRANT OFFICERS

The Warrant Officer Regular Army Promotion Board adjourned July 14. The list should be released to the field during the September/October time frame.

The Warrant Officer Regular Army Automatic Consideration Board for Fiscal Year 1978 adjourned August 24. The list of those selected was released in September.

The Fiscal Year 1979 Warrant Officer procurement program was announced in DA Circular 601-81 and was released August 22. A copy of the circular may be obtained by calling the Publications Center (Autovon 584-2045/3210). The call should be made by the unit's Publication Management Officer since he/she holds the activity's Publication Account Number.

ALL OFFICERS

All active duty officers and warrant officers may call the Personnel Records Division Automatic Telephonic Answering Service to ask questions pertaining to their Official Military Personnel File (OMPF). This service operates on a 24-hour basis and can be reached by calling AUTOVON 221-8792/3 or Commercial (202) 325-8792/3. As calls are received, a recorded message will ask for basic identification data from the caller. The caller will then be asked to state the request. Requests are transcribed and logged during the next normal operating day. Every effort is made to provide a telephonic or written response to the individual within five working days.

Questions which are appropriate for this service include:

- Has the OER for the period ending (state ending date of the OER) been filed?
- Has the award (indicate specific award and date of the award) been filed?
- Has the specific document authorized for file been filed?

Questions which cannot be answered by this service include:

- Requests for copies of documents or copies of the OMPF. Only written requests will be accepted.
- Lengthy or complicated problems pertaining to the OPMF. These questions should be referred through the servicing Military Personnel Office (MILPO) to the Personnel Records Division.

Engineer Personnel Management Contacts in OPMD:

- Colonels Division (DAPC-OPC-AF)
  Engineer Assignments /
  Lieutenant Colonel Lin Lufkin / x7871

- Lieutenant Colonels Division (DAPC-OPL-AS)
  Engineer Assignments /
  Lieutenant Colonel Thomas Fisher / x0423

- Majors Division (DAPC-OPM-A)
  Engineer Assignments /
  Major Wayne Roth / x8109

- Combat Support Arms Division (DAPC-OPF-E) (Company Grade)
  Engineer Branch Chief /
  Lieutenant Colonel H. A. Froehle / x0650
  Captain Assignments /
  Major Mike Foster / x0651
  Lieutenant Assignments /
  Captain Bob Melchior/x7434

- Warrant Officers Division (DAPC-OPW-AU)
  Engineer Assignments /
  CW3 Aleck Fletcher / x7837

NOTE: Commercial telephone line: Numbers above preceded by 202-325-.
AUTOVON line: Listed number preceded by 221-.

OERs

Early in the life of the current Officer Evaluation Report, there existed a wide disparity in scores between and within commands. As a result, many raters felt the need to send to DA unsolicited, after-the-fact explanatory letters which attempted to clarify their original rating intent. Even though not specifically authorized by regulation, these letters were accepted and filed. In the past few years the score disparity has disappeared and with it the value of the explanatory letter.

Effective 6 June 1978, explanatory letters concerning previously submitted OERs are no longer accepted for inclusion in the OMPF. The change in policy does not affect the submission of addendums as authorized in AR 623-105.

MICROFICHE FILES

The program to mail out a personal copy of the microfiche Official Military Personnel File (OMPF) to every active duty officer and warrant officer in the Army has been completed. More than 94,000 files were mailed, beginning last November. However, approximately six percent of the files were returned to MILPERCEN because the address reflected on the data base was not current.

Officers and warrant officers who have not yet received their personal microfiche file copies should forward a request directly to: Commander, MILPERCEN, ATTN: DAPC-PSR-SR (Document Request Section), 200 Stovall Street, Alexandria, VA 22332. The request should include name, social security number, duty telephone number, and the address to which the microfiche copy is to be mailed.

The OMPF paper files from which the microfiche files were created are still available for purchase by individuals, but time is running out. The paper files of general officers and colonels will be retained only until 1 March 1979. Warrant officer files will be retained only until 1 April 1979. Captains may purchase their paper files until 1 May next year, lieutenant colonels have until 1 July, and lieutenants have until 1 September.

Files may be purchased in person at MILPERCEN's Records Review Office, Room 5S33, Hoffman II, or through the mail by writing to the same address.

Purchases by mail should include a check made payable to the Treasurer of the United States. The total amount of the purchase price is determined by grade and includes the cost of mailing. The fees, by grade, are listed below.

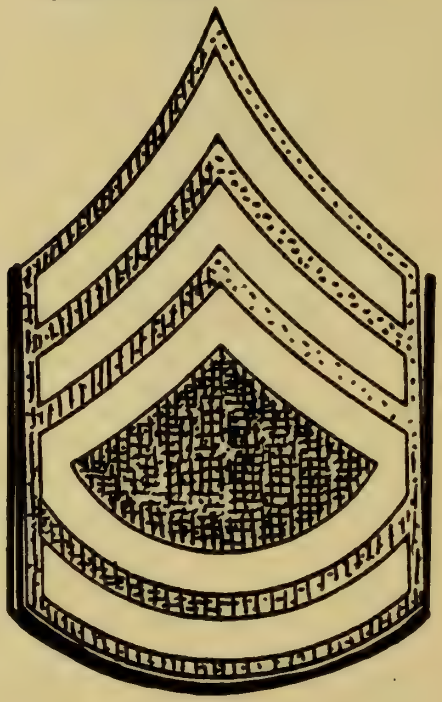
GRADE	AMOUNT
General Officers	$6.00
Colonels	5.50
Lt. Colonels	4.75
Majors	4.50
Captains	4.25
First Lieutenants	4.00
Second Lieutenants	3.00
Chief Warrant Officers (CW3 and CW4)	5.00
Chief Warrant Officer (W2) and Warrant Officer (W1)	4.50

SPECIAL OMPF UPDATE

To expeditiously process OMPF updates on a priority basis for officers in the zone of consideration, a special processing section has been established in the Officer Personnel Records Branch at MILPERCEN. Documents for OMPF updates should be sent through the MILPO to: Commander; MILPERCEN; ATTN: DAPC-PSR-RP; 200 Stovall Street; Alexandria, VA 22332.

A letter of transmittal indicating name, grade, social security number, and the identification of the selection board by which the individual is being considered should be used.

Enlisted Career Info



NEW ASSIGNMENTS POLICY

Under a new assignments policy spelled out in AR 614-30 (effective 15 August 1978), Hawaii is included as part of the CONUS sustaining base for reassignment purposes. In other words, soldiers stationed in Hawaii who are nearing completion of their tours will be considered along with soldiers stationed in CONUS for selection as replacements for other overseas areas, such as Germany, Korea, Japan, Alaska, etc.

Priorities for selection of personnel for any overseas assignment are outlined in chapter of the regulation. These priorities are designed to maintain overseas assignment equity. Soldiers stationed in Hawaii have been placed low on both the long and short tour area priority lists.

Changes in the assignment policy were the result of a revision of Department of Defense Directive 1315.7, "Military Personnel Assignments" and reflect an effort to reduce personnel turbulence and rising PCS costs. Other regulations and changes stemming from the revised directive are expected later this year.

OMPF PROBLEMS

The Official Military Personnel File (OMPF) should accurately represent the accomplishments and shortcomings of every soldier's military career. The OMPF is made up of many documents from a variety of sources, and it is important that every authorized item be included. As far as selection boards are concerned, if it's not in the OMPF, it doesn't exist.

Currently, thousands of these very important OMPF documents are backlogged because of one common problem: missing or incorrect social security numbers.

The Records Maintenance Division at the Enlisted Records and Evaluation Center (EREC), a field operating activity of MILPERCEN located at Fort Benjamin Harrison, IN, maintains more than 666,000 enlisted records. Over two million documents flow through this office each year.

Although the problem of missing or incorrect SSNs is not new, it has been magnified during the past two years by the on-going conversion of the OMPF from paper to microfiche.

Adding a document to the microfiche OMPF is a quick and simple process when the document contains a valid SSN, but when the number is missing or incorrect, the process becomes an administrative nightmare.

So help yourself by helping the folks who maintain your OMPF. Make sure every document submitted to EREC for inclusion in your file contains your social security number.

CAREER ADVISERS

The Enlisted Engineer Career Branch, U.S. Army Military Personnel Center (MILPERCEN), has the mission to get the right soldier with the right grade and skill, to the right command, at the right time. The branch chief is normally a Corps of Engineers lieutenant colonel and his professional development non-commissioned officer is normally a sergeant major. The sergeant major's job is mainly one of coordination, while the real work—advising the soldier in the field—is accomplished by Career Advisers.

A Career Adviser is selected because of his expertise in his field, not because of his qualifications as a personnel specialist. He is the most important person in the branch when it comes to managing your career. He is the one who makes sure each soldier is properly assigned and that career progression is considered. He is also the person who answers questions on future assignments, schools, promotions and career goals in general.

Master Sergeant Kelly Brown is the Career Adviser for Career Management Field (CMF) 81, Topographic Engineering, plus MOS 12E, Drill Sergeant (at Fort Leonard Wood only), and all E8s and E7s (P). Sergeant First Class Garry Barth is the Career Adviser for CMF 51, General Engineering, and Sergeant First Class Al Henderson is the Career Adviser for CMF 12, Combat Engineering.

The Enlisted Engineer Career Branch maintains a Career Management Individual File (CMIF) for grades E6 through E8 in CMF 12, 51 and 81 (except MOS 81E and MOS 82C). CMIFs are also maintained for grades E1 through E7 in MOS 12E and individuals having a Special

Qualification Identifier (SQI) "X" (drill sergeants at Fort Leonard Wood only). These files are a major tool used by career advisers in managing your career.

The files contain copies of Enlisted Efficiency Reports (EERs), Senior Enlisted Efficiency Reports (SEERs), Enlisted Evaluation Data Reports (USAEEC Form 10), copies of DA Form 2, DA Form 2-1, item 38 of DA Form 20, Enlisted Preference Statement (DA Form 2635), reclassification actions, and letters pertinent to the individual's career or letters of inquiry submitted by the soldier.

Should you, at any time, wish to call or write your Career Management Branch regarding an assignment or other aspects of your career, the address is: U.S. Army Military Personnel Center, ATTN: DAPC-EPL-E, 2461 Eisenhower Avenue, Alexandria, Virginia 22331. The telephone number is (Commercial) Area Code 202, 325-7710/11/12 or Autovon 221-7710/11/12.

SKILL QUALIFICATION TESTING

Skill Qualifications Tests (SQTs) for Career Management Field 12 will be conducted January 1 through June 30, 1979, according to the latest word from the U.S. Army Training Support Center at Fort Eustis, VA. All personnel with MOS 12B, 12C, and 12E should have already received their Soldier's Manuals, which were distributed to the field during the May-June time frame. The Soldier's Manual is the soldier's personal copy to retain and maintain. It is his/her personal textbook to career advancement.

LETTERS OF COMMUNICATION

Effective August 1, a new procedure for filing letters of communication to selection boards was initiated. All such letters, including all inclosures, are now considered privileged correspondence and filed with the record of board proceedings maintained by MILPERCEN, instead of being filed with the OMPF.

Also effective August 1, only letters from personnel in the primary zone of consideration are accepted. In the past, letters from personnel in both the primary and secondary zones were accepted.

Because letters of communication have previously been filed in the OMPF, some members have been using them as a means to insure that documents of career importance are added to the OMPF. With the changes in filing procedures, this means of file update is no longer available. OMPF material must be submitted through the MILPO, not directly to the board.

OFFICER CANDIDATE SCHOOL

Applications are being accepted from active duty enlisted personnel and warrant officers for Officer Candidate School (OCS) at Fort Benning, GA. OCS is a 14-week course designed to produce professional commissioned officers for various Army branches. Basic eligibility requirements are:

- No more than 10 years of active service at date of OCS completion.
- Two or more years of college credit (minimum of 60 semester hours).
- At least 19½ and not more than 29 years of age on enrollment.
- Test scores of 110 GT, 115 OCT, and composite OCT/OQI of 200 for male and 115 GT for female personnel.

Other requirements include leadership ability, an outstanding military attitude, and high motivation to become an officer. Weight and height requirements are listed in AR 600-9. If the applicant is overseas at the time of application, 24 months of the tour must be completed (waiverable).

The first step for soldiers interested in applying for OCS is to complete a DA Form 61, Application for Appointment. Unit commanders are then responsible for counselling applicants and administering an Army Physical Fitness Test, and rating each applicant.

Check with your local Military Personnel Officer or unit commander for additional details of the application process.

The next deadline for receipt of OCS applications at MILPERCEN is 22 January 1979, so interested personnel shouldn't waste time in submitting their DA Form 61 to their unit commanders.

EERWA DATA

As of 30 June, the Enlisted Efficiency Report Weighted Averages (EERWA), by pay grade Army wide, were as follows:

PAY GRADE	EERWA
E-9	124.24
E-8	123.49
E-7	121.91
E-6	119.39
E-5	116.43
E-4	111.57

An up-to-date compilation of the weighted averages is scheduled for release by MILPERCEN in October 1978.

Tactical Problem

You are the commander of Company A, 54th Engineer Battalion, currently in direct support of the 1st Brigade of the 54th Infantry Division (Mechanized). As the brigade engineer, the brigade commander has discussed with you the requirement for a tactical minefield to support one of his battle positions.

In further discussions with the Brigade S-2 and S-3, you note the following: the required minefield will be located from AB042835 to AB048843; the task force commander who will cover this obstacle with observed fires requires at least three mobility kills on a Threat force armor company proceeding through the minefield in company line formation; a gap of 150 meters must be left in the tactical minefield to facilitate the withdrawal of the corps covering force; and the leading Threat force tanks are given a 60 percent capability of neutralizing any encountered mine.

You have determined that sufficient M15 antitank and M16 antipersonnel mines are available to install the required minefield, and that your battalion commander will issue one of his M57 antitank mine dispensing systems to your company. In order to reduce installation time, you have decided to include only one antipersonnel mine for each antitank mine your company emplaces. In addition, the brigade #S-3 air officer has just notified you that up to three sorties of the M56 helicopter-delivered scatterable mines are available from corps' 178th Assault Helicopter Company if you can utilize them.

In planning this tactical minefield, you must determine the density, the time required to emplace the field using the M57 antitank mine dispensing system, and the number of M56 helicopter-delivered scatterable mine sorties needed to close the gap in the field.

See page 40 for THE SCHOOL SOLUTION

THE ENGINEER

welcomes your comments on any material published. You may have your viewpoints/ideas published as "Letters to the Editor" or you may wish to submit a feature length article for consideration. If you have something to contribute, let us hear from you.

Editor

Reserve Components

FROM THE CHIEF, ARMY RESERVE

"Proof is in performance, and there is no room for non-performance in the Army Reserve. Our mission and responsibility to the nation, to our communities, and to our families are too important to allow any unit, large or small, to drift along."—Major General Henry Mohr, Chief, Army Reserve.

MOBEX 78

A mobilization and deployment exercise labeled "Nifty Nugget" is scheduled to run from 10 October to 3 November at numerous FORSCOM and TRADOC installations. The thrust of the paper exercise is to evaluate mobilization and deployment systems and procedures. Full mobilization play will take place at the following Army installations: Fort Benning, Fort Bragg, Fort Carson, Fort Chaffee, Fort Dix, Fort Drum, Fort Hood, Fort Knox, Fort Riley, and Camp Shelby. Each Reserve Component unit scheduled for mobilization at these installations during the first 30 days of mobilization will send a player cell representing that unit's command element to the installation one weekend during the exercise. There, the cells will review mobilization procedures with the installation staff.

Player cells representing early deploying Reserve units will report to one of 39 installations in CONUS, Hawaii, and Puerto Rico to review deployment procedures and to determine if the units are actually deployable.

RECORDS CONVERSION

Personnel records of active reservists, both unit and Individual Ready Reserve (IRR) members, are being converted to microfiche. The conversion process is expected to take up to three years.

A decision on the disposition of paper records once the conversion to microfiche is completed will be made later. If the paper records are made available to individuals, a processing cost will be charged. Requests for paper records prior to notification will be returned without action.

06 PROMOTION BOARD

The board scheduled to consider Reserve Component lieutenant colonels for permanent promotion to colonel has been rescheduled. Originally set for 7 August through 1 September, the board was rescheduled to convene at the U.S. Army Reserve Components Personnel and Administration Center in St. Louis on 22 October. It is scheduled to adjourn on or about 17 November.

NEW COURSES AVAILABLE

Two new NCOES courses will be taught by many USAR schools this year. They are the Primary NCO Course, Combat Arms (PNCOC-CA), and the Primary Leadership Course (PLC). The Combat Arms Course is designed to develop leadership skills for E4s in MOSs 11B/C/H, 12B, 13B/E/F, 16P, and CMF 19. It will be taught during two weekend training sessions and during two weeks Annual Training. The Primary Leadership Course involves management instruction for junior combat support and combat service support personnel. It can be taught on weekends, evenings, or during two-week Active Training sessions.

NEW ENLISTMENT OPTION

Students and seasonal workers who enlist for six years in a troop program unit now have the opportunity to participate in their initial Active duty for training (IADT) in separate sessions. Under a new option, new enlistees may return to their home station following successful completion of active duty basic training, an eight-week period. Within one year of the last day of basic training, the individual returns to IADT for advanced individual training (AIT). Enlistment grades authorized by Table 2-4, AR 140-111 are applicable to nonprior service applicants enlisting for this program. No participant, with the exception of honor graduates, however, will be promoted to grade E-3 or above until completion of AIT.

EQUIPMENT FALLACY

Many reservists apparently believe that new equipment will be issued to Reserve units in the event of mobilization. Such beliefs are unrealistic. Equipment currently on hand is considered part of the total assets of the Army, and new equipment is procured by matching these total assets against total requirements. This means each unit must maintain on-hand equipment and be prepared to use that same equipment in the event of mobilization.

FACTS AND FIGURES

- Reservists on continuous active duty for 30 or more days may now apply for Army Emergency Relief loans through their units.
- Approximately 25 percent of all Army personnel belong to the Army Reserve.

The School Solution

You determine from Appendix M, FM 20-32 (Mine/Countermine Operations at the Company Level) that the required antitank mine density is 0.80 mines per meter of front. This gives a field density of 0.8 AT — 0.8 APF — 0 APB.

Since the frontage of the minefield is 1,000 meters (3-4-5 right triangle), the time required to emplace the field using the M57 antitank mine dispensing system for the M15 antitank mines and laying the M16 antipersonnel mines by hand is calculated as follows:

Frontage to be laid: 1,000 meters minus 150-meter gap = 850 meters

AT mines required equals frontage times density: 850 mines times 0.8 mines per meter of front = 680 mines (M15)

Add 10 percent for non-parallel rows: 680 times 1.10 = 748 mines

$$\text{Time required} = \frac{\text{M15 mines required}}{\text{385 mines per hour}} + \frac{\dfrac{\text{APF mines}}{\text{8 per man hour}} + \dfrac{\text{APB mines}}{\text{16 per man hour}}}{\text{30 men per platoon}} \times 1.20$$

$$\text{Time required} = \frac{748}{385} + \frac{\dfrac{748}{8} + \dfrac{0}{16}}{30} \times 1.20 = 1.94 + 3.74$$

$$= 5.68 \text{ platoon hours}$$

The number of helicopter sorties required to close the gap in the minefield is calculated as follows:

Frontage of gap = 150 meters

$$\text{Number of mines required} = \text{AT density times frontage}$$
$$= 0.80 \times 150 = 120 \text{ M56 AT mines}$$

$$\text{Number of sorties} = \frac{\text{M56 mines required}}{\text{160 mines per sortie}} = \frac{120}{160} = 0.75 \text{ or 1 sortie}$$

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FROM THE EDITOR

THE ENGINEER magazine is designed as a medium for disseminating information throughout the Army engineering community. Its goal is to increase the understanding of the role and importance of the engineer on the battlefield and to promote the professional development of the entire engineer family. Those goals are met best if engineers in the field tell us what they are doing and ways they see to improve the profession of arms as engineers. One way to do that is to provide input to THE ENGINEER. Input may take one of several different forms—letters to the editor, feature length articles, photographs, artistic material, announcements, brief news items, or simply suggestions on how to improve the magazine. Remember, THE ENGINEER is your magazine. With your help, we can make it a top-flight professional journal.

JJH

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Engr.

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Soviet Combat Engineers

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UNITED STATES ARMY ENGINEER CENTER AND FORT BELVOIR

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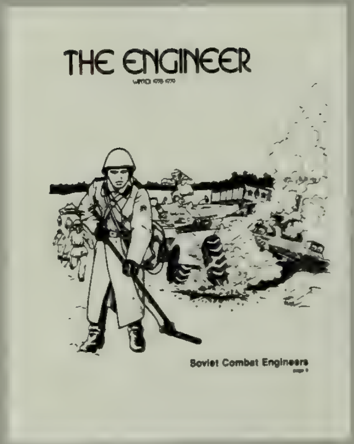
THE COVER

Soviet combat engineers perform many, but not all, of the same functions as their U.S. counterparts. Major Arthur J. Parr, Jr., examines the staff and organization of Soviet combat engineers beginning on page 6. Cover art by Staff Sergeant Mike Furr.



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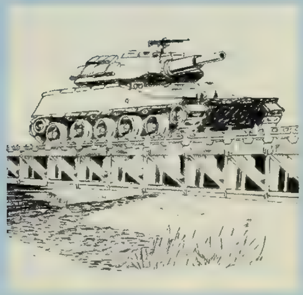

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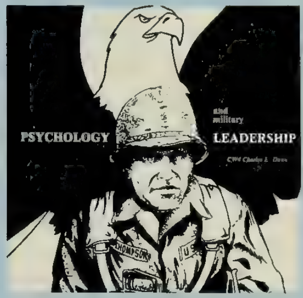

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News & Notes

FTX

Troops of the 5th Engineer Battalion (Combat), US Army Training Center Engineer and Fort Leonard Wood, prepare to attach the deck plate to the superstructure of a Class 60 float bridge during their Field Training Exercise last fall. The FTX, considered the most comprehensive ever for the 5th Battalion, covered 5,400 square miles with training sites at Fort Leonard Wood, Wappapello National Guard Training Area, Mark Twain National Forest, Weldon Spring, and Stockton Lake. The FTX culminated an eight-week training cycle during which each company of the battalion rotated to each training area to practice different combat engineer operations. (U.S. Army photo by 1LT David Faltot)

LAB OF THE YEAR

The U.S. Army Engineer Topographic Laboratories (ETL), Fort Belvoir, VA, has won the U.S. Army Laboratory of the Year award for scientific and technical achievement in mapping, military geography information, and geographic intelligence systems. A total of 32 laboratories competed for the 1978 award.

Specific achievements which helped ETL win the prestigious award included: development of the Digital Interactive System for image interpretation and special product research and development; development of a Print Head System to place map names and symbols; development of digital input-output display equipment (DIODE) which automates techniques for editing cartographic data; and development of mathematical and computer techniques for storing millions of terrain data points.

MOS 12B SURVEY

Military Occupational Specialty 12B, Combat Engineer, was one of six MOSs surveyed during the first quarter of FY 79 to provide feed back on job skills and training. Results of the survey should be ready for MOS management officials and training centers early this year, according to MILPERCEN. The purpose of MOS surveys is to get soldiers' opinions and critiques of job qualifications, specific duties performed and benefits of job training. Results are studied to arrange future training and testing to correspond more closely with duties rather than job descriptions.

CITY BUILDERS

When members of the 34th Engineer Battalion of Fort Riley, KN, set their minds to a task, they seem to be able to accomplish wonders. For example, with the assistance of the 203rd Engineer Battalion, a Missouri National Guard unit, they constructed an entire city in less than three months. A little hard to believe, but nevertheless true. Of course, the city consisted of just 13 wooden buildings, but it will do just fine for training purposes. The single and two-story structures were designed and built to provide a combat-in-cities training environment for infantry, armor and military police units at Fort Riley. The "city" is located about four miles north of the installation's new troop billets on a four-acre training site.

NEW OCE DIRECTORATE

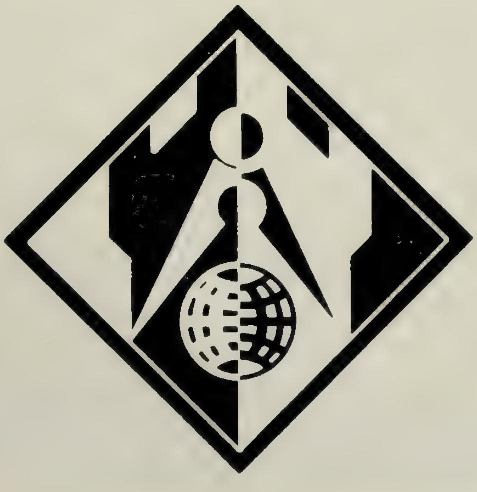
A new directorate has been established in the Office of the Chief of Engineers (OCE), replacing the Military Construction and Facilities Engineering Directorates. The new Directorate of Military Programs, headed by Major General William R. Wray, is designed to streamline military programs and strengthen support to the Army.

PEOPLE

- **Private First Class Andrew D. Leach,** Company A, 307th Engineer Battalion (ABN), was selected as the 82nd Airborne Division "Trooper of the Month" for October 1978. Leach is a 20-year-old Combat Construction Specialist from El Paso, TX.
- **Colonel Lee Roy Nunn, Jr.,** has been selected to suceed Colonel George R. Robertson as the Alaska District Engineer, effective this June. Colonel Nunn is currently attending the Army War College.

NEW INSIGNIA

A new shoulder sleeve insignia for military personnel assigned to U.S. Army Corps of Engineers divisions and districts is now being distributed. The new insignia is a 2¼-inch square with white border, placed point up. The background is divided in half vertically with white and scarlet. It bears a castle tower divided in half with scarlet and white. Opened dividers are centered above a gridlined globe, both divided in half with white and scarlet. The globe symbolizes activities of Engineer divisions and districts, the dividers symbolize design and planning, and the tower is symbolic of the construction mission.



Equipment Update

MGB TEST ANALYSIS

The U.S. Army Test and Evaluation Command's analysis of the test report on the Medium Girder Bridge has been forwarded to the Troop Support and Aviation Materiel Command in St. Louis for a final decision on the MGB. The test report, based on three years of testing and evaluation by the Materiel Testing Directorate, Aberdeen Proving Ground, had been labeled "very favorable" by test director William Deaver.

MINE CLEARING ROLLER

Pre-production tests on the first two Track Width Tank Mounted Mine Clearing Roller Systems are scheduled to begin in May at Aberdeen Proving Ground, MD.

The production contract was awarded last August to Chrysler Corporation. It called for the production of 15 mine clearing rollers at a cost of $1.5 million.

The system consists of a retrofit kit, mounting kit, roller kit and fixture kit. It weighs less than 10 tons and can be mounted in the field by a tank crew in less than 15 minutes for use day or night under all weather conditions.

The roller is about 90 percent effective against pressure fused mines buried up to four inches when traveling up to 10 miles per hour. A weighted chain suspended between the roller assemblies clears tilt rod mines. It can survive blasts from two 22-pound high-explosive mines. Under battle conditions, the rollers can be released in less than 30 seconds using a hydraulic disconnect system.

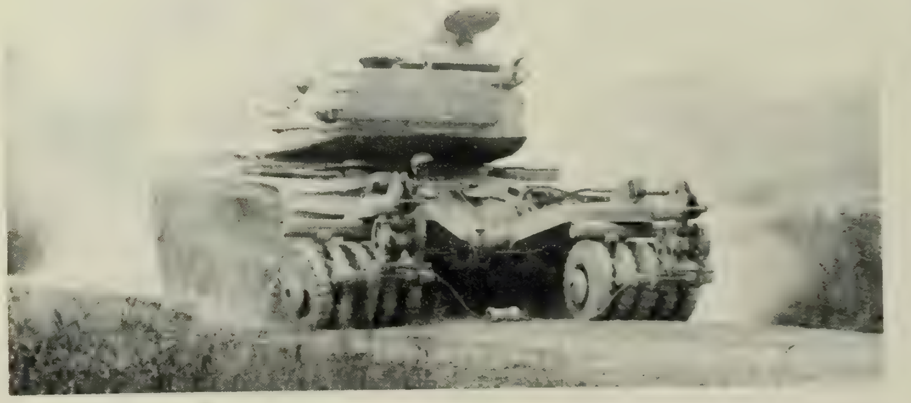
FAMECE

Type classification of the Family of Military Engineer Construction Equipment (FAMECE) is expected on or about 15 February. If the decision is to buy, the Army will purchase approximately 150 complete vehicles at a cost of $18 million. Barring unforeseen delays in the production schedule, the first vehicles should be in the hands of engineer field units by the first quarter of Fiscal Year 1981.

FAMECE is the latest mobility concept for combat engineer sectionalized construction equipment. It utilizes a common power module which is capable of rapid coupling (within 30 minutes) to any of eight different work modules to form a highly mobile, combat support construction vehicle.

The vehicles consist of a heavy road grader, a 2½-yard loader, two compactors (vibratory smooth drum/pneumatic and tamping foot/pneumatic), a dumper with 10-ton payload that is also used as a squad carrier, a dozer, a 2,500-gallon water distributor, and a 10-cubic-yard scraper. All modules will be liftable by medium lift helicopter, and complete vehicles will be air droppable.

Final testing of FAMECE prototypes is being conducted in Alaska and at Fort Knox, KY, by the U.S. Army Armor-Engineer Board. The latter tests are being conducted to determine the relative differences in capabilities between FAMECE and commercial construction equipment. Operational testing of FAMECE was completed last year at Fort Bragg, N.C., and Fort Campbell, KY.



Letters to the Editor

Sir:

In response to MAJ Kish's article "Combat Engineers and the Heavy Division" in the Fall 1978 issue, I have to reply for two reasons.

Reason one is a moral obligation to the USAES. For a 21-month period between 1975 and 1977, he and I debated command and control in print. In the history of THE ENGINEER Magazine this is the only subject to spark controversy and a continuing dialogue.

The second and more pertinent reason is to provide information. I'm in complete agreement with the article! The USAES has been teaching and the DA print copy of FM 5-100, Engineer Combat Operations (1979 publishing date), clarifies the composition of Task Forces. Either the divisional or non-divisional engineer battalion must furnish a small staff when they create a TF. Other lessons learned are now doctrine. The little red schoolhouse at Ft Belvoir must point out, however, that the task organization has minor errors. The minus (–) signs are omitted from the 17th and 62nd battalions under divisional troops three times.

The command and control annex of FM 5-100 clearly states the options for task organization. These are not precise formulae. The commander must weigh these carefully as part of the total combined arms operation. Hopefully he has actively participated in the conceptional planning. Feedback from REFORGER 78 confirms this is a fact. Therefore, the emphasis has changed and the Chief of Engineer's concern in his interview response on page 5 can also be allayed. This brings me to the answer for "what is the role of the engineer group headquarters." The group must also be prepared to dispatch part of its staff in the formation of TFs. It also may be a TF itself in an offensive operation that includes a river crossing, for example. But, as pointed out, in the active defense, the subordinate units are mostly depleted. Its role? Simply its future planning. In an FTX during peacetime this is hard to impossible to simulate. Both reconnaisance information and higher level intelligence are meshed with engineer capabilities and anticipated situations. Its a full time job in wartime. The payoff is in winning battles and saving lives. Don't sell group and brigade headquarters short.

DOUGLAS K. LEHMANN
Major, CE

Dear Sir:

The inside back cover of your FALL 1978 issue includes the statement "THE ENGINEER magazine is designed as a medium for disseminating information throughout the Army engineering community."

On page 39 is your RESERVE COMPONENTS page. While the word COMPONENTS is plural, you only present information of interest to, or pertaining to, one component, the U.S. Army Reserve, including their logos to make it official.

There are TWO reserve components, the other being the National Guard. It is both the oldest, and the largest, of the two. More personnel belong to it, in active training units, than in the USAR. And as Engineers, we perform the same tasks and find ourselves a real part of "the Army engineering community."

Perhaps your Reserve page could include both logos, or rotate between the two, so that all your readers know we are also a part of the One Army Team.

LEONARD L. LORGE
CW4, MI ARNG
Assistant Adjutant

We regret the omission of the National Guard from our RESERVE COMPONENTS section in the last three editions of THE ENGINEER Magazine, but we are experiencing problems in obtaining input on NG activities. It is not our intention to exclude the Guard from these pages, because, as you point out, it is the largest and oldest of our two reserve components. However, if we are unable to obtain information pertaining to Guard activities, we can't print it. That's where you, and others like you, can help. Let us know what's happening out there. Tell your unit public affairs officers to get with the program. We recognize that the Army engineering community includes the National Guard, but without your help, coverage of Guard activities in THE ENGINEER isn't likely to improve a great deal.—Editor

Soviet Combat Engineers

staff and organization

Major Arthur J. Parr, Jr.

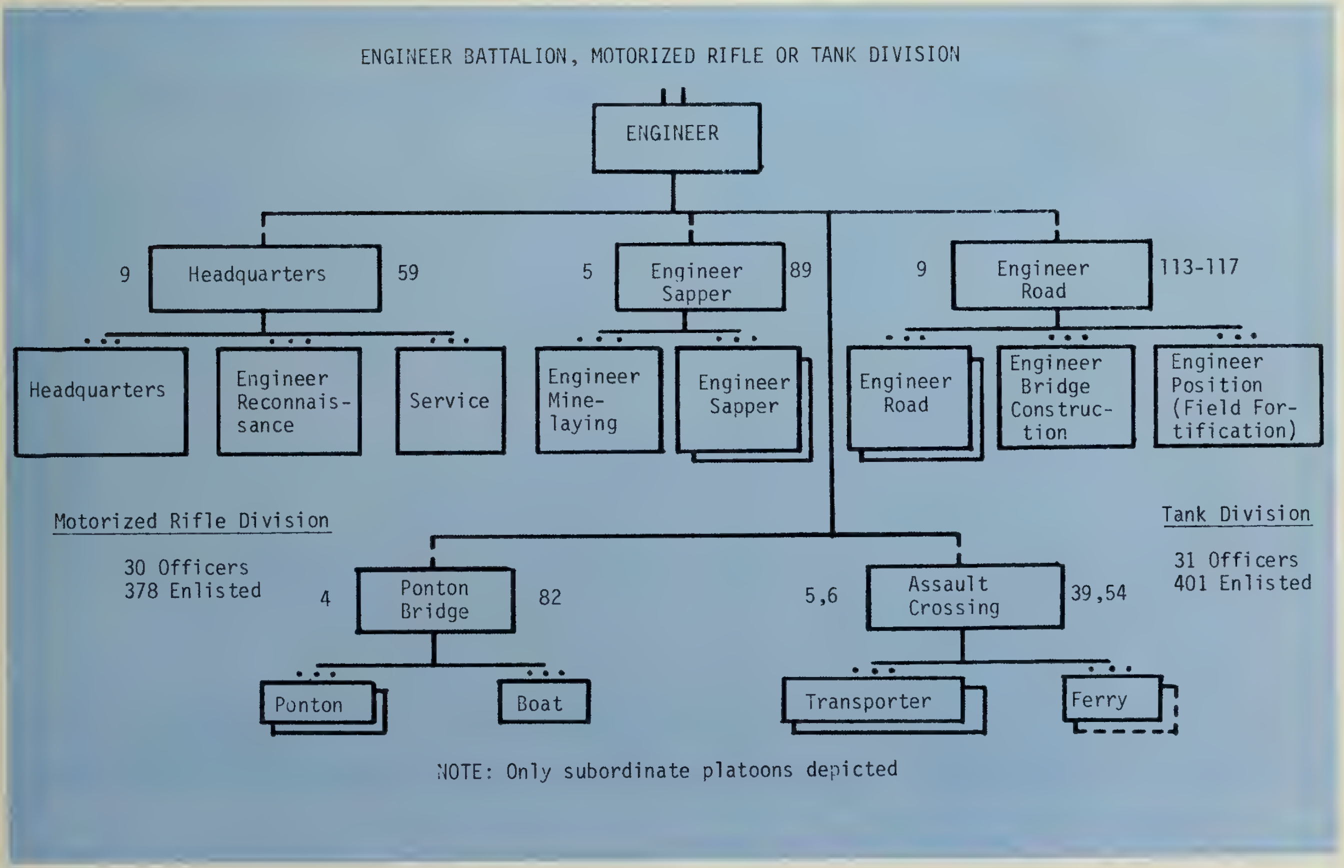
(EDITOR'S NOTE: This article is excerpted and condensed from a research paper prepared by Major Parr in 1978 while a student at the U.S. Army Institute for Advanced Russian and East European Studies. It is intended to be primarily descriptive, rather than analytical, with the Soviet point of view predominating. Primary sources for the article were Soviet military periodicals (1972-1978) and numerous Soviet books on combat engineer related topics, especially Inzhenernoe obespechnie obshchevoiskovogo boia (Engineer Support of Combined Arms Combat), by Pliaskin, Lysukhin and Ruvinskii (1972). All quotations are based on the author's translations of the original Russian texts.)

> ***"Soviet military-engineering art has proved its complete superiority over bourgeois military art in the years of the Civil War and the Intervention, and especially on the fields of combat of the Great Patriotic War . . . . Soviet military-engineering art, guided in its development by Soviet military science, will be the most advanced in the future as well."***

IT IS DOUBTFUL that any Western military engineer would have acknowledged the superiority claimed above by the Soviet author in 1954. Yet, in 1961 the Soviet Union fielded its ribbon bridge, a revolutionary new design of tactical floating bridge. Nearly a decade and a half later, the U. S. Army paid the Soviets the supreme compliment of fielding a new standard ribbon-type floating bridge: a reverse-engineered copy of the Soviet bridge. Soviet engineers provide their tactical units and formations with professional, minutely-planned and dynamic support in all phases of combat, whether in postulated nuclear or non-nuclear situations. The manner in which this support is organized, the units outfitted and employed, is an appropriate topic for detailed study.

In the Soviet Army's vocabulary the term, "military engineer," is a broadly-applied designation for a whole range of military-technical specialties embracing all arms and services. A military engineer may be an artillery engineer, radio-electronics engineer, or a command systems engineer as well as a construction engineer or an engineer in a combat unit. Engineer support, however, generally refers only to combat engineer training, preparation, and measures in support of the various aspects of combat operations, mobility and disposition of troops. It does not include railroad construction and repair, pipeline construction and maintenance, or cartographical preparation and supply.

IN OTHER WORDS, the Soviets understand "military engineer' in a broader sense than it is usually applied in the West, while their concept of "engineer



ENGINEER BATTALION, MOTORIZED RIFLE OR TANK DIVISION

NOTE: Only subordinate platoons depicted

Soviet T-62 tanks crossing PMP ribbon bridge

support" does not encompass some Western combat engineer functions. In this article the generic term "engineer" and the terms "combat engineer" and "sapper" will be used to describe those units (subunits) normally ascribed to engineer support of ground and river-crossing mobility (less repair functions) in division-sized units.

Soviet combat engineers proudly trace their historical antecedents to Russian fortification specialists in the eighth and ninth centuries. Road construction and maintenance is claimed to date to Ivan the Terrible's assault on Kazan in 1552. Regular engineer units were first formed in the 18th century, when Peter the Great affirmed the creation of a company of mine preparers (1702) and ponton teams (1704), and founded a regiment of military engineers in 1712.

Nearer to the present, engineer regiments were formed in 1941 in all military districts and regions, consisting of about one thousand personnel comprising a staff, two engineer battalions, one technical battalion, and support and service subunits. During the Great Patriotic War (World War II) more than 200 brigades, battalions and separate companies were awarded the honorary designation, "Guards." The experience of the war provides a history rich with examples of individual and unit bravery and self-sacrifice, constantly referred to in Soviet military journals as the source of object lessons for psychological preparation and inspiration of engineer troops in today's Soviet Army.

SOVIET engineer authors contend that ". . . . practice has shown that the greater the degree of mobilization, the greater the dependency on the trafficability of terrain and the condition of roads, and the more complex the defense against modern means of destruction." Rivers, mountains and other natural obstacles now present a more serious hindrance to troop movement than they previously did. Overcoming these obstacles requires a high degree of engineer support measures by *all* troops, to include specialized support by engineer units.

The basic goal of engineer support is "to create conditions for more effective application of the means of attack, unhindered movement of friendly troops in the vicinity of the enemy and the effecting by them of maneuver on the battlefield; and also for their defense from the destructive means of the enemy . . . . The basic goals of engineer support to combined arms combat include: the creation of favorable conditions for the deployment of subunits and their swift transfer to the offensive; the effecting of maneuver and successful forcing of water obstacles at high speed; and, with regard to modern weapons, increasing the stability and viability of subunits in the defense."

Engineer tasks common to all forms of combat operations include: reconnaissance of the enemy and the terrain, in close coordination with combat reconnaissance; preparation and maintenance of routes of movement and maneuver; surmounting of natural and man-made obstacles and barriers; demolitions work and the construction of obstacles; fortification and camouflage of positions, areas, command posts and rear facilities; exploration for sources of water and its supply and purification; measures to camouflage troop movements and operations; and engineer actions to eliminate the after-effects of nuclear attack.

AS STATED ABOVE, engineer measures are not the function solely of engineer units. "With the sharp increase in the scale and scope of engineer measures, the role of the basic troop arms in the accomplishment of many tasks of engineer support has increased." In order to avoid excessive reliance on specialized engineer machines, which may not be available in the required numbers in certain circumstances, tanks and other tracked vehicles can be fitted with a number of special "strap-on" items (dozer blades, mine-clearing plows, etc.).

Further, each subunit should also contain several personnel competent to perform certain other engineer tasks, such as mine and countermine warfare, the use of demolitions materials, and so forth. This not only lessens reliance on engineer troop units, but also insures that subunits will have a certain level of organic "engineer" support on hand to fulfill the necessary tasks and reduce the time required to accomplish engineer support in general.

Engineer units are organic in the Soviet ground forces units down to and including maneuver regiments. This provides these units the opportunity independently to resolve the basic tasks of engineer support. When necessity requires, at the option of the senior commander, additional engineer units may be attached for general support or to accomplish specific tasks. General principles of employment, or guidelines for use of organic and attached engineers, may be enumerated as follows:

1. Concentrate engineer efforts on the main or critical area.
2. Use assets properly. Proper use refers not so much to the application of the capabilities of a given machine, but to the centralized application of units in accordance with tactical requirements.
3. Consider the inherent engineer capabilities of all organizations. When combat troops are detailed to perform engineer tasks, organic or attached units may also be integrated.
4. Attached engineers are most often used with organic engineers, except when the senior commander specifies the mission (intent or use) and the period of attachment. In such a case, he must also stipulate the details of the task, provide covering forces and support, and the timely return of the unit to his control. When the attachment is not thus limited, the supported commander must clarify the details of the mission, provide security, etc.
5. As a rule, organic engineer units are used only for tasks in support of the unit of which they are a part. Attached engineer units may not be diverted to other tasks; they must work only on assigned missions of engineer support of combat operations.
6. Removal of even one man from the normal crew of an engineer machine substantially degrades the effectiveness of the machine and subunit performance. The optimum working day for a man (10 hours) and a machine (15 hours) may be extended in extreme circumstances to demand more from the men and to stress machines to their technical limits, at the option of the combined arms commander.
7. Centralized control is preferred during the preparation of an offensive, during construction of fortifications and minefields, during river crossing operations, and in other rapidly arising situations. Decentralized control, however, is preferred at the start of the offensive, or when switching to the defense.
8. Bridge or crossing sites and passages through minefields, etc., are usually maintained and serviced by the unit which emplaced the bridge (established the crossing) or cleared the passage.
9. Always maintain an engineer reserve to meet new requirements or replace losses.

Heavy self-propelled tracked amphibious ferry (GSP)

Truck-mounted multiple span bridge (TMM)

IN ANY GIVEN tactical situation, with the possible exception of a lesser degree of emphasis during the preparation of the defense, the bulk of engineer planning and control authority rests with the chief of engineer services (*nachal'nik inzhenernoi sluzhby*, or NIS) located as a member of the commander's special staff at all levels down to maneuver regiment. "The regimental chief of engineer services both in peace and in time of war is responsible for organization of engineer support of the regiment; preparation (training) of regimental personnel in engineer matters; support of the regiment with engineer equipment, to include maintenance in working order of that equipment; and combat and mobilization readiness of the engineer-sapper subunits of the regiment." It must be assumed that chiefs of engineer services at higher levels perform essentially the same broad duties.

As noted above, the NIS is a "chief of service," a position which finds its closest U. S. equivalent in the commander's special staff. The NIS is the direct chief (staff supervisor) of all organic and attached engineer subunits, and as such, his directives and the decisions of the commander comprise the basis for organization of engineer support. In the organization and planning of engineer tasks, the NIS assures that:

a) The plan complies with the commander's concept of the operation and his decision, in accordance with the concrete realities of the tactical situation.

b) Engineer tasks are executed in a timely fashion.

c) Actions by engineer units are conducted with due concern for security, so as not to inadvertently divulge the nature of the plan to the enemy.

d) Engineer tasks are clearly defined so as to concentrate efforts in the direction of the main effort or on critical defense sectors.

e) In accordance with the developing tactical situation, and in close coordination with combat forces, engineer units maneuver correctly in response to requirements.

f) Camouflage and deception measures are applied by all units.

This NIS, usually a major at maneuver regiment level, participates directly in the work of the staff, coordinating his actions with those of the other chiefs of services, but primarily cooperating with the chief of staff and the assistant chief of staff for operations (*pomoshchnik nachal'nika shtaba-1*, or PNSh-1). He contributes to the reconnaissence plan, the combat order, the river-crossing graphic and the plan of CBR defense; he works out the details of the plan of engineer support, the combat disposition of the engineer subunits, and the disposition of combat units assigned to engineer tasks. Although the NIS's organization of engineer support of the unit is quite logically based on his commander's decision, he is also responsive to the directives of the NIS at the next higher level, so that there is a direct technical connecting line between engineer staff officers at all levels.

THE GENERAL sequence of staff-planning procedures followed by the NIS may be briefly summarized. On receipt of the commander's warning order, or his concept of the operation, the NIS quickly clarifies the mission and conducts an estimate of the situation from an engineer's point of view. He considers initial reconnaissance-intelligence data available (map studies, military-geographic studies, long-range reconnaissance information) and issues an alert to the engineer subunit commanders in order to allow them maximum preparation time. He next works out his proposals and recommendations for the plan of engineer support of the operation, to include: the sequence and timing of engineer tasks; forces detailed to engineer tasks and reinforcement of engineer subunits; location, disposition and maneuver of engineer subunits; and mutually supporting operations with units and subunits of other arms and services.

The NIS then presents to the commander his analysis of the terrain and the situation, pointing out area of difficulty or threat, and indicating how his plan recommends dealing with the anticipated problems. The commander may require the NIS or his engineer subunit commander to report on other matters of interest, such as the capabilities of assigned or attached engineer subunits, along with additional recommendations for their employment.

When the plan is accepted and affirmed by the commander, it is signed by the NIS and counter-signed by the chief of staff to become a part of the combat order for the operation. Specifics of tasks assigned to engineer subunits are refined as preparations move forward. Both the NIS and the engineer subunit commander(s) closely monitor the fulfillment of the assigned mission and prepare to shift or reassign assets to address problem areas or meet newly-arisen tasks during the course of the operation.

TYPES OF ENGINEER units in the Soviet ground forces include reconnaissance, sapper, road, position (field-fortification), bridge construction, camouflage, crossing-assault, ponton, and special subunits for obstacles, countermine warfare, water supply and other functions. All these types of units and subunits have been discussed in recent issues of Soviet military journals, with two exceptions: the subject areas of camouflage and water supply continue to be of concern, but specific engineer units charged with carrying out these functions are not noted.

The organizational data presented in the tables represent the findings and, in some cases, the opinions of the author. They are not official Department of Defense (DOD) or Department of the Army (DA) holdings. They are composites based to some degree on open-source Soviet, East German and Polish military publications. Probably no Soviet engineer company or battalion conforms precisely to these organizational figures. Regional and other variations may create fairly wide deviations from these rough guides. They may, nevertheless, serve for a general analysis of the type of combat engineer support at division and maneuver regiment level.

Within the maneuver elements of a regiment, tank dozers are available on the basis of one per tank battalion, and mine clearing plows on the basis of one per tank platoon (nine per battalion). both are normally transported on 7-ton or 5-ton trucks.

THE ENGINEER company of the maneuver regiment has nine or more additional plow sets, and roller plow sets are available, probably on the basis of one per tank battalion in the regiment. The company also has road construction, position preparation, mine and countermine warfare, reconnaissance, and short gap bridging capabilities—in short, some capability for every type of engineer support available in the division except float bridging and amphibious transport.

The division-level engineer battalion has five specialized companies. Tactical employment of engineer units, however, does not always follow strict organizational lines. The specialized equipment of ponton bridge and assault crossing units limits their application in general engineer support roles. Tactical employment of sapper, engineer-reconnaissance, road and road-bridge subunits generally involves the formation of one or more of the following functional groupings: engineer reconnaissance patrol, reconnaissance/obstacle-clearing detachment, mobile obstacle detachment, and movement support detachment.

For example, the mobile obstacle detachment (*podvishnoi otriad zagrazhdenii*—POZ), deployed to blunt enemy armored thrusts or seal off flanks or penetrations, may be based on a sapper platoon, but usually is formed around (or consists wholly of) a sapper minelayer platoon equipped with self-propelled minelayer vehicles or towed minelayer trailers, augmented by anti-tank guns or missiles. The movement support detachment (*otriad obespecheniia dvizheniia*—OOD) may also be formed around any sapper unit, but this function is normally assigned to elements of the road-bridge platoon (at maneuver regiment level) or the road company of the divisional engineer battalion.

Major Arthur J. Parr, Jr., is currently assigned to the Office of the Joint Chiefs of Staff as a Presidential Translator on the Washington-Moscow hotline. He is a Russia-East Europe Foreign Area Officer who has served with the 1st Infantry Division and the 5th Special Forces Group (airborne) in Vietnam, and with the Defense Intelligence Agency as a Soviet Ground Forces Analyst.

Engineer obstacle-clearing vehicle (IMR)

FASCAM

in defense of cities

Major George F. Smith

Large scale city fighting in World War II, Korea, and Vietnam was a relatively rare occurrence primarily because doctrine stressed the notion that built-up areas were to be isolated and bypassed rather than risking costly, time consuming operations in a difficult environment. But urban sprawl in the highly industrialized countries of Western Europe has forced a departure from that doctrine.

An examination of the traditional avenues of approach into and through West Germany quickly establishes the importance of urban sprawl to modern tactics. These historical avenues are no longer unobstructed routes suitable for fast moving armor operations but are frequently blocked or narrowed by a series of urban areas.

Soviet doctrine stresses that offensive formations attacking across highly developed regions will encounter at least one large built-up area every 70 kilometers and numerous villages and clusters of structures that restrict and even block traditional avenues of approach. Since Soviet attack doctrine also stresses that Soviet forces will advance 60 kilometers per day, it is obvious that confrontations could occur in built-up areas.

Retired British Major General J.F.C. Fuller has written that the defense "should command the roads leading toward and through the area being held. The knots in the road are villages, hamlets and small towns. These knots are also tank-proof. Therefore, small towns and villages are the first areas that must be considered." These "knots in the web," as Fuller characterizes them, are ideal locations for antitank strongpoints.

Built-up areas supplement or extend obstacle systems. Building complexes are in themselves obstacles to a mechanized force. Therefore, with minimal effort and materials, a built-up area can become a significant obstacle to advance. Passage can be blocked, canalizing enemy armor into open natural terrain interlaced with anti-armor fires and reinforced with mines and other obstacles. The built-up area can itself become one huge tank and soldier killing zone with an insatiable appetite.

The skillful integration of built-up areas into the total defense scheme enhances and strengthens defensive combat power to attrit, delay and eventually defeat a numerically superior force.

THE USE OF MINES IN THE CITY

To maximize the defender's advantage within the city, defenses are organized in depth. Depth is achieved by selecting and preparing a series of mutually supporting battle positions, strongpoints and obstacles throughout the built-up area.

The proper selection and location of obstacles immediately increases or multiplies our available combat power. Properly employed, obstacles (in particular, mines) greatly increase the killing capability of our antitank weapons by increasing the amount of time that a target is in the "target window." While obstacles are discussed in most of the literature concerning combat in

built-up areas, details concerning the proper use of mines is sorely lacking. In fact, the new family of scatterable mines (FASCAM) is rarely mentioned.

The Combat in Cities Report, published by the Infantry School, concluded paradoxically that standard pattern minefield construction time precludes its use in many cases, but that mines can be used effectively along streets and at intersections within the city and at critical choke points along likely avenues of approach into the built-up area. One must hastily add that the built-up area, itself, is a choke point.

Supporting the Report's conclusion concerning conventional mines is an extract from a KETRON, Inc., Technical Report, which states, "The current inventory of mines is not suitable for use in the city. Both off-route and scatterable mines would assist in controlling specific areas by canalizing movement of enemy forces and slowing the rate of enemy advance." Before isolating on the employment of FASCAM in cities, it is first necessary to discuss current U.S. doctrine regarding the defense of a built-up area so that FASCAM can be logically introduced.

DEFENSE OF A BUILT-UP AREA

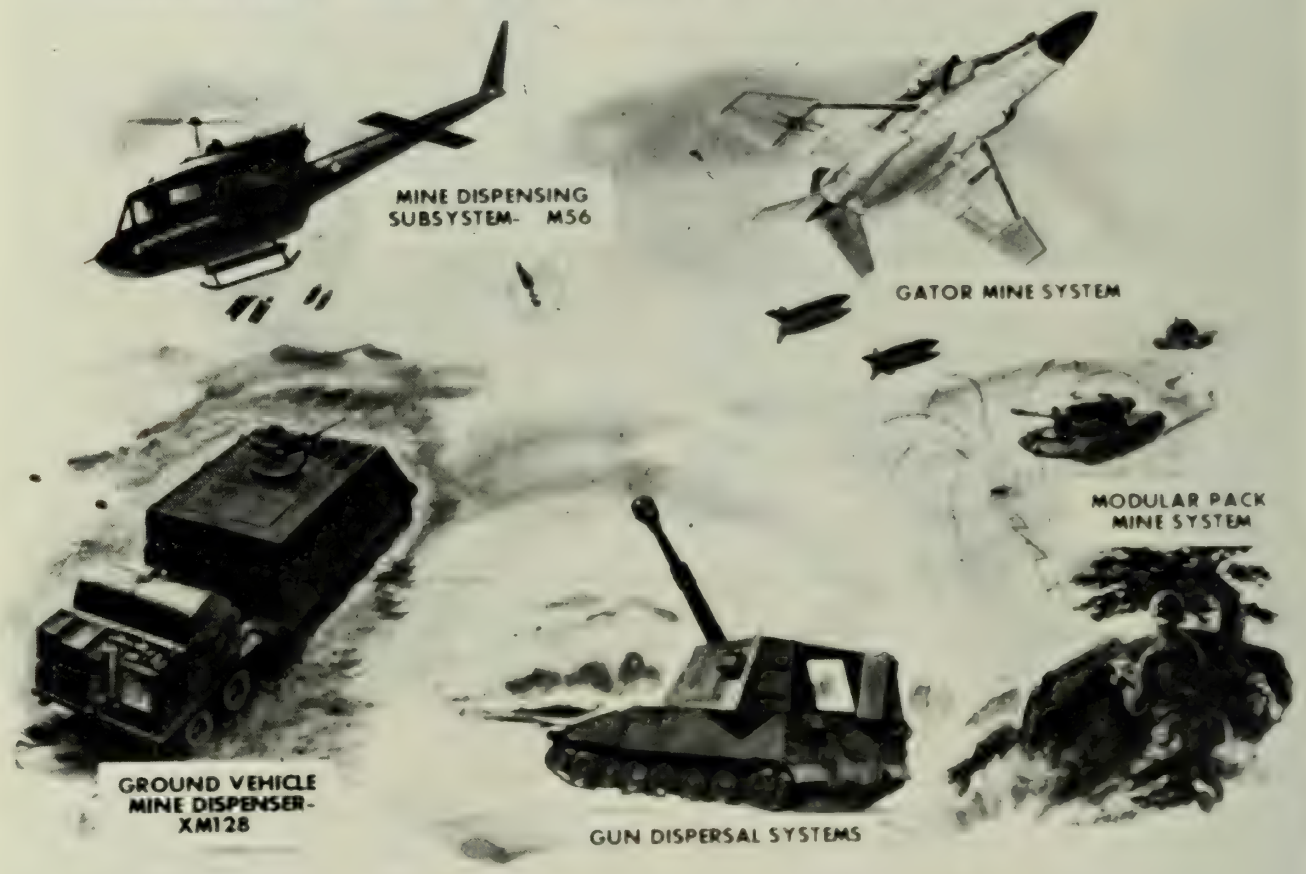
The defense begins well forward of the city on terrain suitable for a balanced combined arms covering force designed to wear down the attacker and cause him to reveal his intentions before reaching the built-up area. As the attacker approaches the periphery of the city, he comes within range of anti-tank guided missiles and tank and artillery fire from strong, mutually supporting battle positions and strongpoints of the main battle area arranged in depth throughout the built-up area.

Success is achieved by an integrated defensive scheme between forces in the city and forces defending adjacent terrain. The key to defense within the city is the strongpoint, where squad and platoon leaders will often be required to fight independent battles without detailed orders. The skillful use of mines and obstacles will greatly enhance the defensive capability of these mutually supporting strongpoints.

THE USE OF FASCAM

The use of scatterable mines in the covering force area forward of the built-up area is essentially no different than in the normal defense. Prior to the battle, maximum use must be made of the Ground Emplaced Mine Scattering System (GEMSS) and M56 to rapidly emplace minefields along likely avenues of approach to enhance the effectiveness of covering anti-tank weapons.

Particular attention must be given to obstacles on the flanks of the city since it would be the defender's intention to force the attacker into the city. As the covering force withdraws, Artillery Delivered Anti-vehicle, Antitank and Anti-personnel Mines (ADATM and ADAPM) can be effectively employed in front of enemy formations to assist in breaking contact and further attriting the enemy. As the enemy comes within range of the Main



RESPONSIVE DELIVERY MODES FOR SCATTERABLE MINES

MINE DISPENSING SUBSYSTEM- M56
GATOR MINE SYSTEM
MODULAR PACK MINE SYSTEM
GROUND VEHICLE MINE DISPENSER- XM128
GUN DISPERSAL SYSTEMS

Battle Area (MBA), the Surface Launched Unit-Mine System (SLUMINE) can rapidly seed the obvious avenues of enemy approach and close breaches in existing minefields. The range of the SLUMINE prohibits its use forward of the MBA.

Within the city itself, the various types of scatterable mines must be emplaced to support each battle position and strongpoint. The uses for FASCAM inside the built-up area are limited only by the imagination of the defender. Because employment of these mines within the city is the heart of the issue, each mine system will be considered separately in an examination of several possible applications.

ARTILLERY DELIVERED MINES (ADAPM AND ADATM)

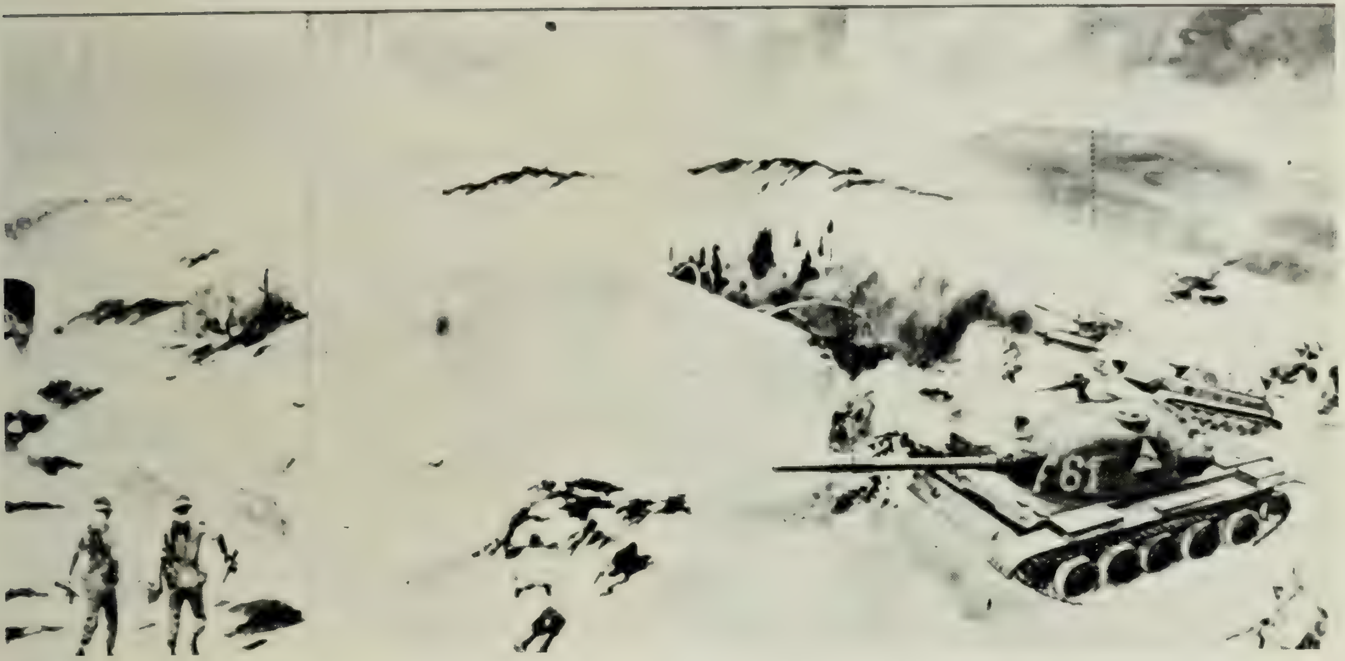
Since the effectiveness of artillery may be degraded due to restricted observation, proximity of friendly forces to enemy troops, the corresponding requirement for pinpoint accuracy, and frequent attachment of artillery sections to infantry platoons and squads, the ADAPM and ADATM should rarely be used within the city. Furthermore, the weight of the ADATM mine, coupled with its rate of descent, would virtually insure its penetration of roof tops and cause the interior of many buildings to be mined. The effectiveness of an anti-tank mine in a basement is limited.

The ADAPM, however, could be used since it is not heavy enough to penetrate roof tops. In fact, anti-personnel mines emplaced on roofs would be effective in blocking that traditional avenue of approach by infantrymen in the city.

GEMSS

The GEMSS is ideally suited for the rapid emplacement of mines throughout the city. Streets and boulevards can be mined as easily as parks and cemetaries. However, mined areas must be marked to preclude friendly casualties. In most cases the defender's routes of withdrawal and lateral movement will be above or below ground, thus reducing the concern for mines in the street. The defender will use the street far less than the attacker. However, counterattack routes must be kept open. The limiting characteristic of the GEMSS is its long self-destruct time. Areas mined with it are essentially denied to defender use.

SEQUENCE OF OPERATIONS FOR MODULAR PACK MINING SYSTEM (MOPMS)



M-56 HELICOPTER DISPENSED SYSTEM

This system could not be used once the battle in the streets begins due to its high vulnerability. However, before the battle begins, it could be used to mine large, open areas such as parks, autobahns, and the like.

SLUMINE

SLUMINE is capable of covering large areas rapidly. Therefore, like the M56, it has limited effectiveness within the city, although it is not vulnerable to air defense fire like the M56. Its principal use within the built-up area might be to contain a penetration in an open area or to re-seed a breach in a GEMSS field, also in an open area. The low angle of fire of the SLUMINE rocket severely limits its application in areas containing tall buildings. The SLUMINE launcher would be more effectively employed firing SLUFAE at soft targets.

MODULAR PACK MINE SYSTEM (MOPMS)

This system has the greatest utility of any FASCAM system for combat in cities. It is easily transported and does not require a launch system. It can be placed easily in support of squad and platoon strongpoints, activated when required, and recovered if not employed. Not only would it be effective in the streets against tanks and soldiers, but it could be devastating if employed inside a building following withdrawal by defenders and just prior to enemy seizure. The expenditure of the MOPMS could be extremely effective if the building is a critical strongpoint.

MANUALLY EMPLACED MINE SYSTEM (MEMS)

This system is not currently in development, but could prove very useful in urban combat. The MEMS is essentially an ADAPM which is activated by pulling a pin and throwing the mine into place. Consider the effect of leaving one of these in each room of a building as the defender withdraws. Similar employment could be effective on flat rooftops, in alleys and doorways, and particularly in trafficable sewers. Extreme control of such a system would be necessary to prevent friendly casualties resulting from over-enthusiastic employment.

CONCLUSION

The family of scatterable mines has truly added a new dimension to mine warfare and the mechanized battlefield. No longer is mine warfare limited to open terrain on the traditional battlefield. FASCAM will enable the defenders of cities to more effectively and efficiently employ their anti-tank weapons to kill the enemy and win the first battle.

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The Topographic Element of Combat Power

Major Craig R. Hutchinson

SEVERAL new "How to Fight" manuals have been published and a detailed knowledge of FM 100-5 (Operations), FM 101-5 (Command and Control of Combat Operations), and TC 101-5 (Control and Coordination of Division Operations) is necessary to keep abreast of the situation. However, if you search these manuals for the topographic element of combat power, you will not find it in bold print. In fact you have to read between the lines to find it at all.

You may find clues to the topographic element of combat power in FM 5-100 (Engineer Combat Operations), FM 100-10 (Combat Service Support), and FM 101-10-1 (Staff Officers Field Manual; Organization, Technical, and Logistical data). However, two new field manuals (FM 21-32 Topographic Support and FM 5-146 Engineer Topographic Units) discuss the topographic element of combat power in detail. Since the new manuals won't be published until later this year, let's examine the topographic elements of combat power today.

First, what is the topographic element? To find out, let's go to the new FM 101-5 which presents a systems approach to operations and defines functional systems for corps down thru battalions. Specifically, it includes the following corps functional systems: Command, Control, and Communications (C3); Maneuver; Engineer; Intelligence; Fire Support; Air/Ground Operations; Electronic Warfare; Air Defense Artillery; and Combat Service Support.

THE TOPOGRAPHIC element is not explicitly stated here, but one can pick up its tracks in the engineer system, which equates to mobility/countermobility and survivability and is composed of divisional and corps engineer units. According to FM 5-100, in corps engineer units you will find a cartographic company of the engineer topographic battalion, theater army. It is in this cartographic company that the topographic element can be found. Topographic elements and their functions are defined by FM 5-100 as follows:

MAP DISTRIBUTION—Operating the corps map supply and distribution system down to division level.

MAP UP-DATING—Planning and supervising local map revision to meet the needs of the corps.

PRINTING—Producing revised maps, map supplements, overprints, sketches, drawings, and terrain intelligence material to meet the needs of the corps.

ANALYSIS—Provide terrain intelligence, prediction, and analysis of the effects of terrain factors on military operations to corps and divisions.

SURVEYS—Provide survey information required by the combat elements in support of their modern weapons systems.

But, what is combat power? It is not explicitly defined in the new FM 100-5. The Command and General Staff College defines combat power as leadership and the functions of land combat under the influence of environment and tactics. Specifically, "A unit's ability to develop and apply combat power is directly dependent on the unit's capabilities for performing the functions of land combat, i.e., firepower; intelligence; mobility; command, control, and communications (C3); and combat service support." If firepower and mobility are equated with fire support and maneuver in the corps functional systems previously presented, one can see that the functions of land combat are a subset of the corps functional systems. Thus, performing land combat can equate to managing the corps functional systems and we have a working definition for combat power: it is the command, leadership, and management of a unit's functional systems within the influence of environment and tactics.

THE QUESTION remains as to how the functional systems are managed in order to obtain combat power from the topographic element? According to FM 101-5, each functional system within a unit interfaces with every other system in the unit. Thus, the engineer system interfacing with all other systems provides the topographic element in some form to the other systems. FM 21-32 (Topographic Support) and FM 5-146 (Engineer Topographic Units) provide the details of this interface and thus the answer to our question. However, let's examine the topographic element interface between the engineer system and C3 system.

The C3 system consists of: The Commander and Staff; Communications; Staff Organization; Staff Procedures; and Decision Making. The topographic element interface between the engineer system and the C3 system includes assisting the commander and staff in communications, staff procedures, and decision making. Examples 1 and 2 illustrate how the topographic element interfaces in staff procedures and decision making in the C3 system.

EXAMPLE 1

SEQUENCE OF COMMAND AND STAFF ACTIONS*	TOPOGRAPHIC ELEMENT	STAFF INTEF
1. Mission received.		
2. Information to CO and staff sections.	1. Update maps and graphic portion of the Intelligence Preparation of the Battlefield (IPB) data base. 2. Provide updated maps. 3. Gather terrain analysis materials.	G2/G3/G4
3. Mission analysis and CO's planning guidance.		
4. Staff estimates.	Provide terrain analysis input for the IPB.	G2/G3
5. CO's estimate including decision and CO's concept.		
6. Preparation of plans or orders.	Printing of IPB reports and OPLANs or OPORDs on overlays.	G3/G4
7. Approval of plans or orders.		
8. Issue of plans or orders.	Distribution of topographic products.	G2/G3/G4
9. Staff/Command supervision.	Printing of Frag Orders on topographic products.	G3/G4
10. Mission Accomplished.		

*From Superseded FM 101-5

EXAMPLE 2

MILITARY ESTIMATE	TOPOGRAPHIC ELEMENT	STAFF INTER
1. *Mission Analysis* a. What must be done and when? b. Restate for clarity.	1. Update maps and graphic portion of IPB data base. 2. Provide updated maps. 3. Gather terrain analysis materials.	G2/G3/G4
2. *Situation and Courses of Action* a. What is the situation? (1) What enemy forces are opposing us and where? (2) How can the terrain be used to gain an advantage? (3) What is the effect of the weather? (4) What friendly forces are available? b. What are feasible courses of action to accomplish the mission?	Provide terrain analysis input for the IPB.	G2/G3/G4
3. *Analysis (Wargame) and Comparison of Courses of Action* a. Wargame courses of action. b. What is the best course of action and why?	Provide terrain analysis and printed graphics as required.	G2/G3/G4
4. *Decision or Recommendation (Concept)* a. Refine the best course of action into a clear decision/recommendation. b. Announce the decision/recommendation. c. Commander issues concept. d. Issue plans/orders.	1. Printing of IPB Reports and OPLAN/OPORDs overlays. 2. Issue of maps and related topographic products.	G2/G3/G4

*From new FM 101-5

PART OF the command and staff's combat power in the C3 system lies in the accuracy and timeliness of their actions interfacing with the military estimate and decision process. As illustrated above, the topographic element contributes to that accuracy and timeliness. In making staff estimates, the topographic element supports the Intelligence Preparation of the Battlefield (IPB) by providing:

a. Up-to-date maps (changes in roads, vegetation, and obstacles);

b. Terrain Analysis (cross-country movement maps, underground complexes, possible enemy drop zones, utility complexes);

c. Rapid printing.

The functional systems of a unit interface within the unit and with the functional systems in the units above and below. Through such interface, the use of the topographic element for communicating OPLANs and OPORDs with graphic overlays and overprints further achieves its combat power.

Thus, the topographic element provides combat power in the C3 system by assisting in providing more accurate and timely staff procedures, decision making and communications.

IT IS EASY to see combat power in the barrel of a loaded gun pointing at you. It is not so easy to see combat power in a combination of a sequence of command and staff actions and a military estimate and decision process which resulted in pointing the loaded gun at you. However, the sequence of command and staff actions and the military estimate and decision process are key tools in the C3 system for commanders and their staffs, and the topographic element is an integral part of its employment.

Who has the staff action for coordinating the topographic element of combat power in the corps? FM 101-5 indicates the responsibility remains with the Assistant Chief of Staff, Intelligence (G2). Actually, the G2 recommends engineer topographic troop assignments in coordination with the corps engineer. Therefore, if you are looking for topographic support to meet your C3 needs, check with your G2 section.

The 649th Engineer Battalion in Europe is currently providing a tactical topographic task force (T3F) in direct support to the US corps in Europe in order to keep the corps in tune with the topographic element of combat power. In addition, the battalion is providing a T3F to support the divisions as required. This is a change to previous and current doctrine, where direct topographic support was no lower than the corps headquarters. The 649th is exercising its tactical topographic task force on corps and division FTXs and CPXs as requested. This provides terrain analysis for the exercise areas and results in the production and distribution of necessary products to meet corps and division needs.

THE TASK FORCE consists of a terrain analysis element and a Tactical Information Printing (TIP) element. The two elements work together in order to satisfy required response times for a timely sequence of command staff actions at corps and division level. For example, the task force maintains up-to-date map changes in a format ready for tactical information printing on standard products, including changes in roads, autobahns, quarries, and vegetation, as well as other up-to-date IPB information the corps or division G2 requires.

To meet the needs of the modern battlefield, TIP can overprint and provide 500 copies of any single-color map in the area of operations within one hour. One objective is for the corps and divisions to provide hard copies of topographic products used and developed in the sequence of command and staff actions and military estimate and decision process as far down as company level if time permits. This eliminates some of the time wasted in "gathering" around the situation map and provides for more rapid dissemination of IPB reports, OPLANs and OPORDs.

The T3F is augmented with a map distribution element to assist in bulk map distribution at corps level and also with a survey element to assist the corps in bringing control forward.

Is the topographic element of combat power a requirement of the peacetime force structure? In order to maneuver forces, you must be able to direct them as rapidly and accurately as possible. This requires terrain analysis and survey as well as distribution of the graphics and data necessary for weapons systems, estimates, OPLANs, and OPORDs to combat commanders prior to the first battle. Only combat commanders can decide if it is required for our peacetime force structure, for they must be prepared for the first battle on very short notice.

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THE MEDIUM GIRDER BRIDGE

panacea
or
problem?

Major Harvey G. Ramsey

The Medium Girder Bridge is here; we must now prepare to cope with it. The introduction of the MGB into our units in Europe will provide an additional dimension to the engineer capability on the battlefield. Its impact will be felt most significantly in two critical resources areas—time and manpower.

The positive qualities of the MGB have been demonstrated in both field tests and actual operations. It can be constructed faster and with less manpower than the Bailey bridge which it compliments!

I have used the word "*compliment*" because it is included in the brief doctrinal statement concerning the employment of MGB which follows:

a. The Medium Girder Bridge and Bailey bridge will be used as complimentary systems pending fielding of a mechanically launched system.

b. MGB should be used forward in the Main Battle Area (MBA).

c. Bailey bridge should be used in Lines of Communication (LOC).

d. TOE units should be pure MGB or Bailey bridge rather than composite.

e. Maximize availability of the MGB on the battlefield by replacing emplaced MGB with Bailey bridge when possible.

f. Recommended basis of allocation for the MGB is two sets per division.

The purpose of this article is not to tout the obvious advantages of the MGB or to diminish the value of Bailey by unfair comparison. Rather it is my intention to point out that the MGB has critical limitations which must be considered by the commander in the field. Since some of the MGB's weaknesses are strengths of the Bailey system, I suggest that perhaps our current thoughts on allocation and deployment of these two bridges do not take maximum advantage of the capabilities and limitations of each system.

Given the doctrinal framework, let's examine the advantages and disadvantages of MGB more closely.

ADVANTAGES

a. *Speed of construction*—The MGB allows significantly faster construction rates. For example, a class 60 MGB 103 feet long can be built in 90 minutes. An equivalent Bailey bridge would take about five hours.

b. *Reduced resources*—The 103 foot MGB could be constructed by only 25 soldiers. The equivalent Bailey would require 71 soldiers.

c. *Interoperability*—Our NATO allies are largely equipped with MGB. Equipping our units with MGB would promote compatibility on the battlefield.

d. *Palletization*—The MGB is stored on pallets in the unit. This enhances construction site organization and significantly improves upload problems from depots or bridge parks.

DISADVANTAGES

a. *Limited capacity*—The MGB cannot be constructed in any manner to allow passage of vehicles greater than class 60. Allied nations apparently plan to use the bridge as their primary tactical bridging equipment. They have developed ancillary equipment to offset this deficiency. The US Army has not initiated action to procure ancillary equipment.

b. *Limited length*—MGB is currently limited to lengths of 103 foot military load class (MLC) 60. There is no capability within existing equipment to install the bridge with intermediate supports. Addition of the cable reinforcing system will extend the class 60 length to 162 feet but this reinforcing system is not expected to be available until calendar year 1980 at the earliest.

c. *Limited life*—The MGB is made of an aluminum-zinc-magnesium alloy. It has a well identified fatigue problem which reduces its value on lines of communication. Its estimated life is 10,000 class 60 crossings. The more we train with the bridge, the shorter will be its useful combat life. Stated doctrine implies that the bridge will be a dynamic battlefield asset. This is to say it will enhance the main battle area; being emplaced and removed as battlefield mobility requirements arise. Loss of useful life due to erection, extraction, and hostile fire have yet to be determined. It is safe to assume that continued use will contribute to existing problems of metal fatigue. Our current system for determining fatigue conditions is simply to check for cracks in the outer lugs of panel jaws. When cracks appear, the bridge can still sustain at least 1,000 MLC 60 crossings. Hopefully, we will be able to observe cracks immediately and thus accurately estimate the remaining life.

d. *Limited replacement parts*—Limited procurement, only 34 sets, results in limited replacement parts. Europe is programmed for only 12 sets.

e. *Reduced repair capability*—Since MGB is made of an exotic metal, repair at unit level will be virtually impossible.

f. *Flexibility*—Use of the MGB is rather rigid. Time may produce additional knowledge about uses of the equipment. Flexibility of the Bailey bridge is legend.

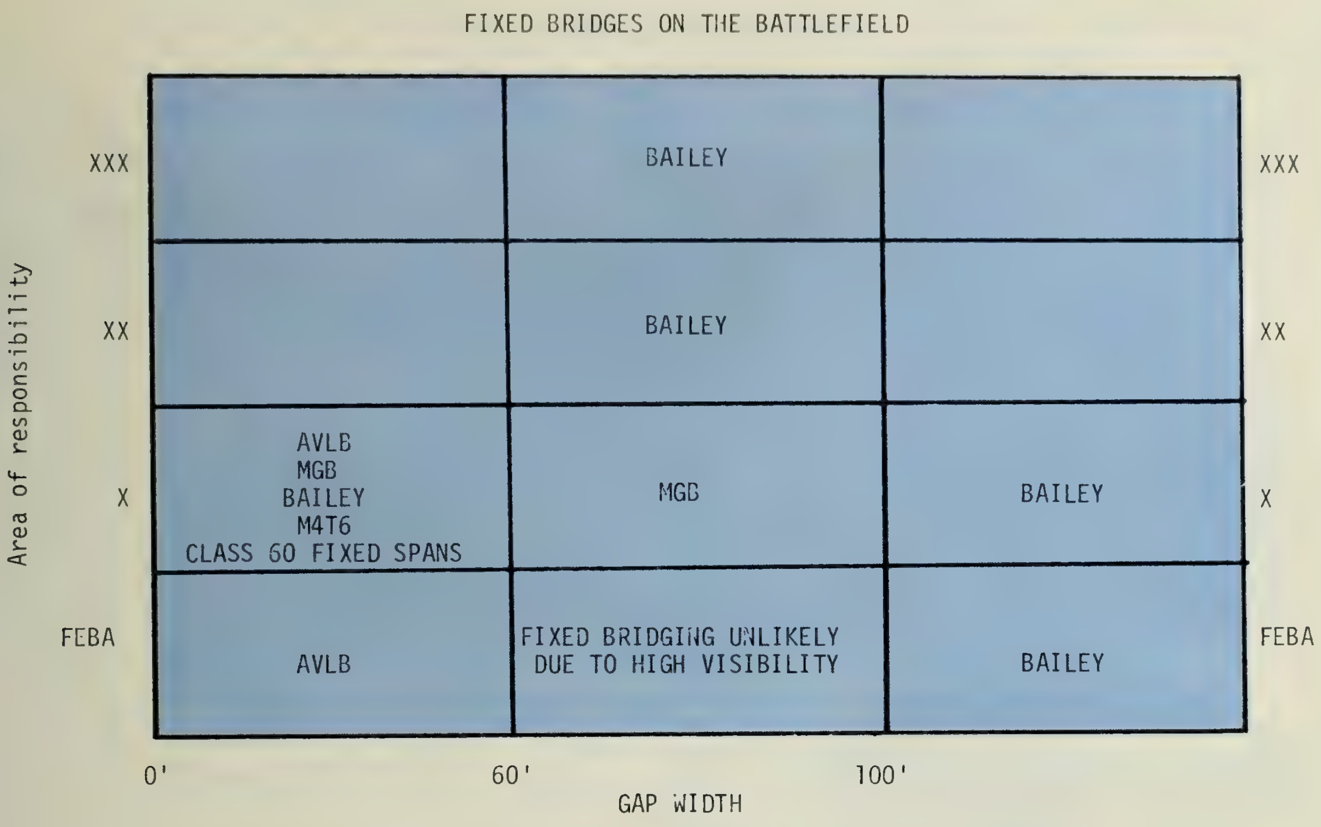
g. *Cost*—One set of MGB is expected to cost $420,000. Bailey bridge, currently on hand, had a procurement cost of $35,391 per set. When the cost of erection sets and pallets is considered, MGB will cost about $3,800 per foot, compared to about $270 per foot for the Bailey.

Since we are preparing for a battlefield characterized by aggressive movement, where does the MGB fit in? Obviously, the Armored Vehicle Launched Bridge (AVLB) will best satisfy the need for gaps less than 60 feet. The MGB can be used to span gaps between 60 and 100 feet. Remember, under *no* circumstances can we utilize MGB for gaps greater than 103 feet.

Under current doctrine, the MGB will be issued to Corps Panel Bridge companies. These units will download, or reduce, their present supply of Bailey. In return, they will be charged with the responsibility to maintain, transport and install the MGB. Installation of the bridge is a new mission for the Panel Bridge Companies. It's a mission which causes some concern in view of the described modern battlefield. The vision of a dump truck-mounted Corps bridge company bouncing around "forward in the main battle area," installing and removing MGB, is ludicrous.

Considering bridging requirements on the future battlefield and comparing the equipment alternatives, the case favoring current doctrine becomes quite tenuous. Figure 1 describes the battlefield in terms of bridging equipment.

Gaps up to 60 feet encountered in the brigade areas are best bridged by AVLB. As the brigade moves, these bridges may be left in place. If not, they may be replaced



FIXED BRIDGES ON THE BATTLEFIELD

Area of responsibility	0'	60'	100'
XXX		BAILEY	
XX		BAILEY	
X	AVLB MGB BAILEY M4T6 CLASS 60 FIXED SPANS	MGB	BAILEY
FEBA	AVLB	FIXED BRIDGING UNLIKELY DUE TO HIGH VISIBILITY	BAILEY

GAP WIDTH

FIGURE 1

by MGB, Bailey, M4T6, or class 60 fixed spans. If the bridge is expected to remain in place for an extended period or if it is on an LOC, the bridge should be replaced by Bailey since MGB has a life span and capacity limitation. Bridges in Division and Corps areas should be Bailey for the same reasons.

Assault gap crossings using Bailey bridge have been conducted, although rarely and at great expense, in the past. Neither the Bailey bridge nor the MGB is an assault bridge. Signature of both bridges on the modern battlefield will mitigate against their use. If, however, such crossings are to be accomplished on the battlefield, they favor the use of MGB. Gaps 60 to 100 feet in the rear of the brigade area are the most likely candidates for use of MGB. In the Corps area, the MGB should be replaced by the higher-capacity, longer-life Bailey bridge.

Since existing equipment limits MGB to 103 feet, wider gaps *must* be bridged by Bailey. Longer term introduction of the cable reinforcing system will expand the MGB to gaps of 162 feet.

I have arrived at an untenable position in direct opposition to current doctrine. I have argued that the inherent limitations of MGB, coupled with limited procurement, mitigate against extensive employment of this bridge on the battlefield. Yet the two bridge companies in Europe are being converted to MGB. Current doctrine requires MGB to be installed by its owning unit forward in the main battle area. I suggest that this concept is folly.

I believe we should combine the best of our available assets by creating composite Bailey bridge/MGB companies. At present, the TOEs of the two companies are almost identical. The retention of Bailey bridge as primary equipment would allow each company to respond to its most likely requirements. We do not currently take advantage of a significant advantage of the MGB—its palletization. Because of this characteristic, it can be more easily uploaded in trucks, helilifted or moved by aircraft to construction sites and installed by the bridge company, a Corps company or a division's combat or bridge company. I suggest we keep the Bailey bridge in the panel bridge companies, uploaded in trucks for rapid deployment, and maintain, at the same place, palletized MGB, ready for deployment to the critical gap.

MGB is a significant addition to our family of tactical bridging. It has practical limitations, but also many advantages. The prudent engineer will understand all its characteristics and deploy it to best support the tactical commander in the field.

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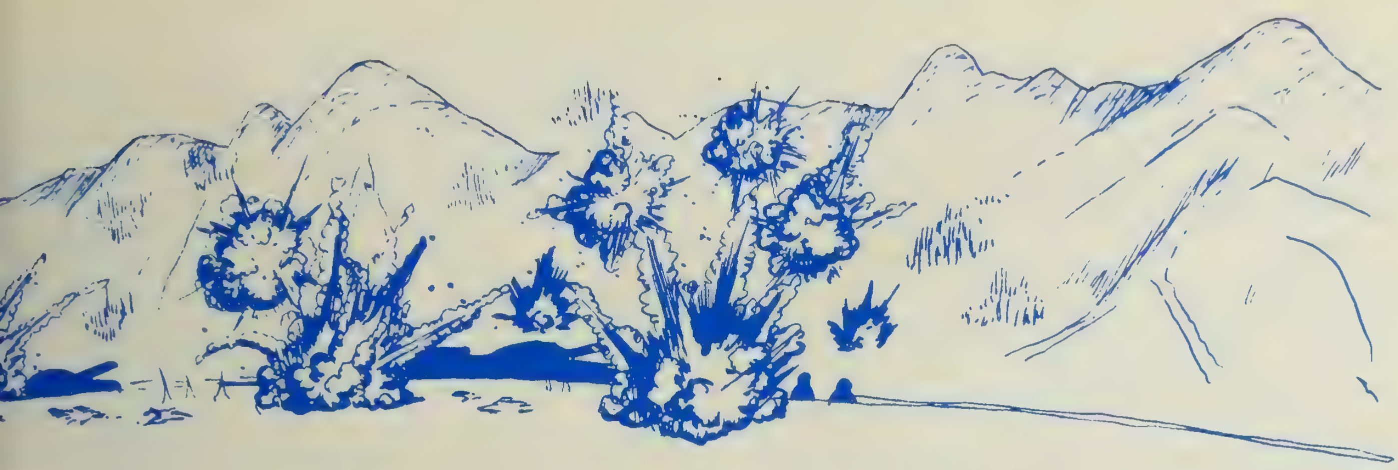
The Rodriguez Tactical Training Range

Lieutenant Colonel John B. Wheeler



The silence of the valley is shattered as high-explosive mortar and artillery rounds whoosh overhead and rip jagged craters into the enemy hill mass just 200 meters away. VT fuse warheads burst much closer, peppering friendly TOW and fighting bunkers with white-hot shrapnel. Air Force fighter bombers scream out of the sky and release their deadly payloads. The earth trembles as bombs explode on target.

Suddenly the artillery and airstrikes shift and M-60 tanks roar toward the objective, stopping only to fire. Cobra gunships rake the hill with rockets and cannon fire. Finally, infantry soldiers charge the pulverized objective, firing on the move.

THE NARRATIVE above describes not an actual battle, but a training exercise conducted regularly by soldiers of the Second Infantry "Indianhead" Division at a unique training site 14 kilometers northeast of division headquarters at Camp Casey, Korea. The Rodriquez Tactical Training Range, a project of the Indianhead's 2d Engineer Battalion (Combat), affords soldiers of the 2d Division and their Air Force counterparts the rare opportunity to participate in live-fire exercises that come as close as possible to replicating the actual pace and pressure of joint air/land combat.

In the fall of 1977, the 2d Engineers were assigned the task of completing the first phase of the range project—constructing 20 reinforced concrete fighting and TOW bunkers—before the onset of the harsh Korean winter. The bunker project, called "Little Line Papa," was to include 18 fighting bunkers and two specially-designed reinforced concrete bunkers to house the ground-mounted TOW anti-tank weapons system. Working closely with the Division G-3, the engineers patterned the defensive positions after similar fighting positions found throughout the Republic of Korea.

While plans, blueprints and materials were being produced, Charlie Company of the 2d Engineers conducted site planning and surveying in conjunction with Division G-3 to determine exactly where each bunker should go to best utilize the existing terrain. Excavation into a ridgeline began immediately. As soon as each bunker site was excavated and leveled, forming and placing of concrete floors was initiated. This first phase of construction presented no real problems and progressed smoothly.

However, when the time came to form and pour reinforced concrete walls and roofs, it became evident that the average 12B Combat Engineer is not familiar with steel work, concrete finishing, and many other construction skills normally associated with heavy construction projects. On-the-job-training and experience gained on the bunker project significantly improved the combat engineers' basic skills and improved unit morale.

NUMEROUS other problems made the bunker project a real challenge. Logistical support and vehicle maintenance was difficult because line platoons were separated from the Company CP by several miles of very poorly maintained road. Truck loads of construction materials had to be delivered daily and personnel shuttled back to garrison frequently for showers and administrative matters. Communications was also disconcerting. All communications with the battalion and company had to be made through Radio Wire Integration (RWI), an unresponsive mode due to heavy use by other units in the division. Security was a 24-hour-a-day consideration. Around-the-clock guards, high-intensity perimeter lighting and triple concertina fencing were necessary to hold down material and equipment losses.

But the most bothersome and frustrating problem, from an engineer standpoint, was the intermittent use of the range for live fire training exercises. Eventually interruptions became so frequent that engineers were permitted to continue work during such exercises.

As Charlie Company engineers developed expertise, production accelerated. Despite the frequent interruptions, construction on 14 two-man bunkers, one large command bunker, two hugh TOW bunkers and three small Dragon firing positions was completed in only 2½ months—well ahead of the cold weather.

To test the strength and durability of the bunkers for live fire exercises, a series of tests was conducted. Hand grenades placed at bunker entrances were command detonated to see if schrapnel would penetrate the entrances. It did not. A 105-MM Howitzer round was then command detonated on top of the command bunker and one of the two-man bunkers, each of which had eight inches of reinfored concrete roof and two feet of earth and rock overburden. Again the bunkers withstood the test. "Little Line Papa" was ready.

AIR FORCE targets were the second phase of the construction at Rodriquez Range. The targets, constructed approximately 900 meters down range from "Little Line Papa," were designed to provide realistic close air support targets during combined arms exercises.

The targets consisted of two simulated bunker positions dug into a mountainside and a simulated North Korean missile site complete with telephone poles for missiles. These were positioned inside earth revetments and were connected by trench lines to simulate a command bunker. This project was finished in five days. With its completion, C Company engineers returned to Camp Castle and were replaced by A Company personnel who focused their attention on the final phase of the project—the 200-meter Moving Target System.

The purpose of the system was to improve TOW/Dragon and tank gunnery accuracy. Construction guidance given to the 2d Engineer Battalion was simply that the target be realistic. Translated, this meant that the target had to be life-sized, move uphill and downhill (as well as on level ground) and vary in speed up to 20 mph.

Complicating requirements was the fact that the system would be some 10 miles from U. S. compound and would not be continually guarded after its completion. This required that the system be capable of disassembly after operation so that all moveable components could be secured. After much discussion, a system was conceived which would meet all requirements.

The moving target range consisted of four main components: the runway (upon which the target cart rides), a reinforced concrete bunker (to protect the personnel required to operate the system), the power system, and a target cart.

CONSTRUCTION of the runway became the mission of the 1st Platoon, A Company, 2d Engineer Battalion. After the site was surveyed, dozers were put to work cutting a slot in a gently sloping hill. A concrete slab (the runway) would lie in this slot protected from the weapon fire aimed at the target moving along its surface. By putting the runway on a hillside, the up/down hill requirements would be met and the natural vegetation above and below the runway would be preserved as well. Faced with cost problems and the threat of theft from nearby indigenous personnel, it was decided that slots cut in the surface of the concrete runway would be used instead of 400 meters of angle iron to guide the cart as it moved. To make the slots, two parallel pieces of 4"x4" lumber were set in the runway, and concrete poured around them. These provided two parallel 3" deep slots when the two pieces of lumber were removed after the concrete cured.

The slabs were poured in 20-foot sections and reinforced with wire mesh to provide strength against extreme temperatures. A "leap frog" pouring method was used to allow one full day of curing before expansion joints were placed and adjacent slabs completed. The platoon was split into three crews. One crew surveyed and constructed the forms, another crew operated the mixers and moved the concrete, and the third crew "worked" the concrete, finished the surface, and placed metal rollers along the center line of the runway. The rollers guide the "drive" rope which makes a single continuous loop from one end of the runway to the other and is tied off to the target cart on both ends.

The runway was 722 feet long and was bordered by gravel, sandbags and ditches as protection against erosion. Continual surveying was essential to keep the runway absolutely straight. The lumber, when properly greased, could be pulled from the hardened concrete with little difficulty. The runway was completed in five weeks.

THE CONCRETE bunker project was undertaken by the 2d Platoon. The bunker was built at right angles to the runway and large enough to hold the one-quarter-ton truck which would be the power source to move the cart. An open slot three feet high was formed in the wall of the bunker which faced the runway. The bunker walls and roof were eight inches thick and made of reinforced concrete. Careful forming and crossbracing were necessary to allow a continuous pour of the entire bunker at one time. Initially, concrete was transferred from the mixer by scooploader, but when the "scoop" broke down, engineers finished the job with wheelbarrows.

The pour took place in late November when evening and morning temperatures dipped into the teens, hardly ideal weather to cure concrete. To overcome this problem, a tent was placed over and a spaceheater was placed inside the bunker to maintain the required temperature. For seven days this "warming process" was used to insure proper structural strength before removing the forms. Finally, layers of sand, rock, and sandbags were placed on the top and sides to serve as a burster layer. When completed, the bunker resembled a hugh dirt and rock mound with one open end.

When the runway and bunker had been poured, the mechanical system had to be designed to move the target back and forth along the 200-meter track. This job was assigned to the battalion's engineer warrant officer who combined his mechanical experience with the talents of his welder and machinist. Using standard issue automotive parts, they put together a simple power system consisting of two jeep wheel rims mounted at either end of the runway. At the far end of the runway the hub was mounted on a moveable sled which sat on the runway and which could be moved further away from the bunker by a block and tackle affixed to a deadman at the extreme end of the runway.

AT THE BUNKER end of the runway, the wheel was mounted inside the bunker on a sheet of half-inch steel plate. A jeep shaft was connected to the rim. This prop shaft was then modified so that it could be attached to the rear differential plate of a jeep which is backed into the bunker. Rope is wound around the drum device, threaded through the rollers along the runway, wound around the hub at the far end of the runway and back over the top of the rollers; both ends are tied off to the cart. The rope is tightened by pulling up slack at the cart as much as possible and then using the block and tackle to eliminate all slack. Power is supplied by the jeep when its rear wheels are jacked off the ground. In forward gear, the cart moves in one direction, in reverse it moves in the other direction and at any speed desired!

The fourth component of the system is the target cart. Nine feet long, two feet wide, and two feet high, it was welded together with four-inch angle iron. It can travel along the runway fully protected from gunners either by the slot cut in the side of the hill (the slot's walls being four to six feet high), or by a 12-foot high berm on level areas. The cart's wheels consist of M113 Armored Personnel Carrier road wheels mounted with jeep bearings and wheel spindles. The road wheels (2½ inches wide) ride smoothly in the slots of the concrete runway. The cart can actually travel at 20 MPH without jumping the track. The target itself is a simulated T-62 tank made out of plywood, 2" x 4" lumber, and target cloth. The Moving Target System was completed in seven weeks. It has been extensively used in TOW/Dragon and tank gunnery practice. The whole system can be set up in about 30 minutes by six men. Additionally, all components subject to theft can be removed at the end of operations and safely secured.

The completion of the Moving Target System marked the end of construction at Rodriquez Range. The entire project—20 fighting bunkers, the Air Force targets and the Moving Target System—cost approximately $20,000. The Range continues to provide both Korean and U. S. soldiers with realistic combined arms training. Equally important, it enabled many combat engineers of the 2d Engineer Battalion to polish their construction skills and ready themselves for a similar task in actual combat.

Lieutenant Colonel John B. Wheeler is currently assigned as the Director of the Department of Military Engineering, Directorate of Training, USAES. He commanded the 2nd Engineer Battalion, 2nd Infantry Division prior to his current assignment.

the
interactive
interactive MAPPING system
system

CW2 Herbert H. Kressler

A measure of success in topography, and especially cartography, is rapid and accurate response. The major problem shared by many cartographers is their inability to produce or revise maps or related products in the quantity and various types desired within an adequate response time. An Interactive Mapping System can provide a means of accurate and rapid revision or compilation and a variety of new products or "services." But before plunging into interactive mapping, let's examine two phases of the map-making process most widely utilized— compilation and color separation.

CONVENTIONAL PRODUCTION METHODS

Map compilation is the incorporation of data assembled from numerous sources such as other maps or charts, aerial photographs and field surveys. These sources are "compiled," i.e., graphically presented on a manuscript containing a properly oriented projection and grid of the appropriate spheroid at a specified scale.

Planimetric compilation (depicting the horizontal position of features only, no portrayal of elevation) can be accomplished by visual interpretation or with the use of various devices that allow the superimposition of photography to an existing map; revisions are then drafted from the superimposition. Planimetric compilation can also be achieved, when the terrain is relatively flat, by segmenting the photography into pieces of relatively equal elevation and then directly tracing from the aerial photo or photomosaic.

Topographic compilation (portrayal of relief features in addition to planimetric detail) is accomplished on analog or analytical stereoplotters which, by using overlapping stero-photos, create three-dimensional models.

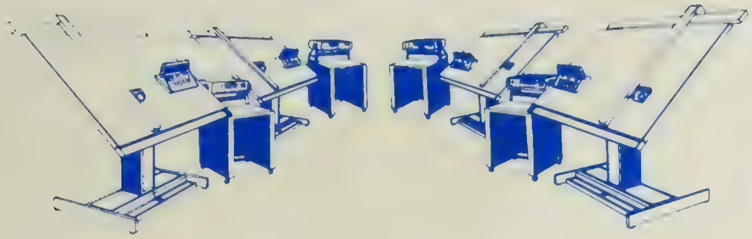
Various features are portrayed on a map compilation manuscript. To produce a five-color map, the features are categorized according to the colors in which they will appear on the final product and drafted accurately and neatly on separate sheets or flats (photographic negatives or positives of final drafted map features). This process is called color separation.

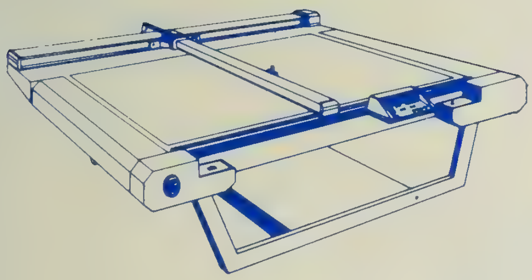
There are different methods of achieving color separation but the most widely used is engraving, or scribing selected features on a coated, stable-base plastic sheet. Color separation must be applied to the compilation manuscript as the lithographic offset printing process requires separate flats to produce press plates of each color that will appear on the final map.

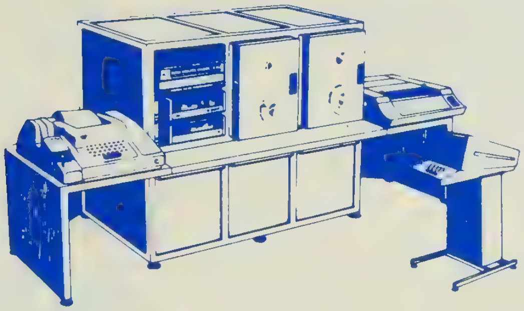
COMPONENTS OF AN INTERACTIVE MAPPING SYSTEM

Prior to explaining how an Interactive Mapping System will enhance the map making process, it is necessary to identify the system's major components— a digitizer, processor, edit station and final output plotter.

Digitizers are used to measure **x, y** coordinates with the operator assigning a code for the features. Digitizers are usually operated manually, but some use scanners. A digitizer station includes a cursor, a detector system (usually built into the working surface) for measuring the cursor position, an alphanumeric keyboard interfaced







with a computer, and an edit station (usually a cathode-ray tube device). In the newest developmental systems an automatic scanner is employed.

The *processor* is a computer and storage device, combined with appropriate software. It is the heart of the interactive system. Speed, flexibility, and capability are highly dependent on the computer size and storage capacity, and the efficiency of its software. The advent of minicomputers has drastically reduced space and cost requirements for this component and the availability of large capacity Random Access Devices (RAD) for storage has made the use of minicomputers for mapping systems feasible.

The *edit station* can be a simple proofing plotter or a cathode-ray tube (CRT) device in which the digitized data is displayed, thus permitting on-line, virtually real-time visual inspection and quality control. Corrections, additions, and deletions can be made and data redisplayed for verificiation prior to final drafting. The final output plotter may be used for this function, but the CRT is generally preferred.

The *final output plotter* produces a pencil, ink, scribe or film copy of the various "flats" of a map. Specifications for this plotter vary widely according to the precision or quality required by the customer. The "flats" are used for making press plates for offset printing of the final product in large quantities.

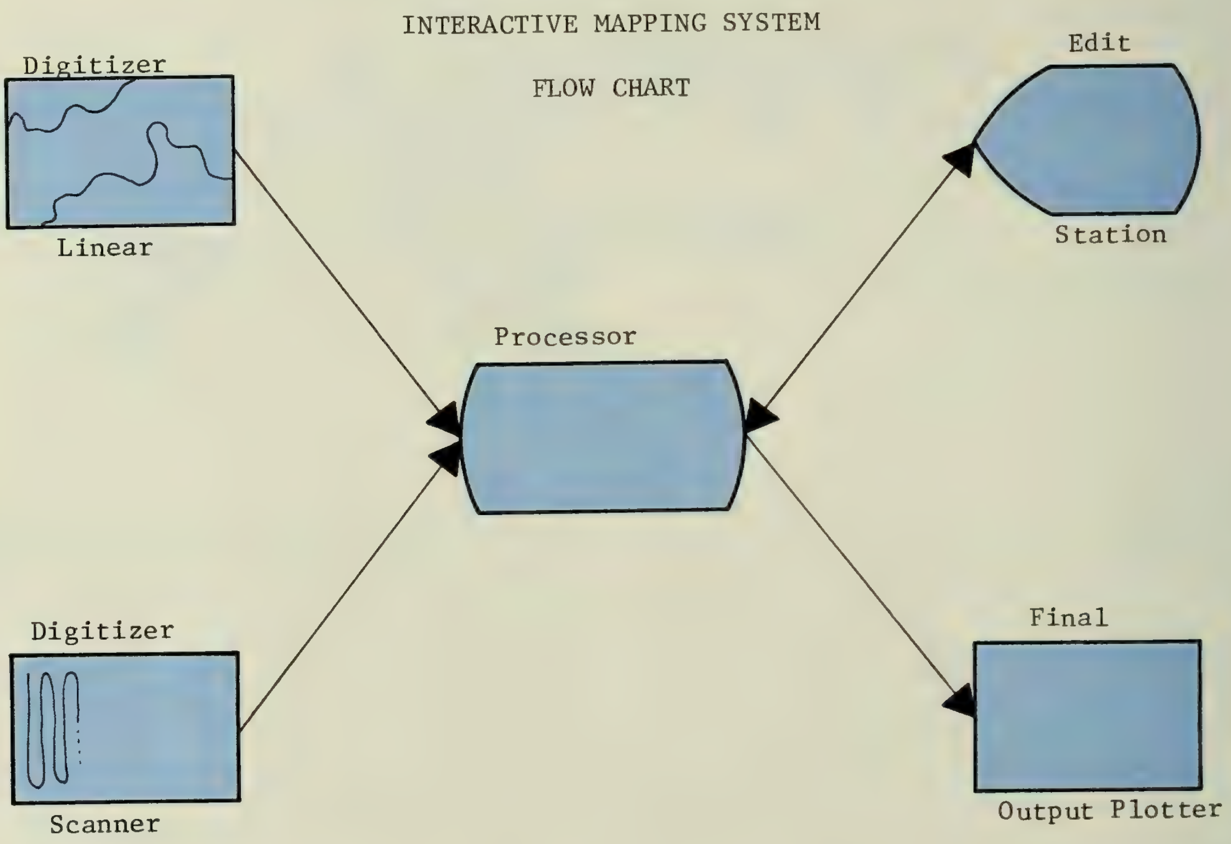
INTERACTIVE MAPPING SYSTEMS

The incorporation of an Interactive Mapping System into the map making process starts with the digitizer, edit station and processor in the compilation phase. Aerial photographs are registered to a geographically-related control base (grid, existing map, etc.), using at least three known points. Digital compilation can then be performed to specifications via the digitizer. The digital data is then encoded and stored by the processor. The data compiled is displayed and verified on the CRT and, if necessary, refined at the edit station. Next, color separation of this digitized compilation can be accomplished by successive selection of data (which was labeled and stored upon input) to be produced on the final output plotter.

Automated cartography became possible in the 1950s with the advent of automatic plotters. It has progressed from simple tasks to complex drafting, from compilation digitizing by a manual (hand-held cursor) system to digitizing by an automatic raster scanner. In the early 1960s the Defense Mapping Agency (DMA) introduced an automated symbols and names placement system and the digitizing of terrain detail. Automated photogrammetric compilation equipment facilitated the recording of profiles and contour detail and greatly contributed to the development of a fast means of producing orthophotographs, which are prepared from perspective photos with compensation for tilt and relief.

In the early 1970s, computer-assisted drafting equipment, with software to symbolize map detail, was introduced. Linear digitization and interactive drafting was followed by a totally digital editing procedure, and today a semi-automatic digital compilation procedure is available. The final steps in the development of this system may be machine recognition of map features followed by fully automated cartography.

Let's examine the disadvantages and advantages of an Interactive Mapping System when injected into a production environment. Disadvantages focus on the high initial cost of the equipment needed to implement the system. Other causes for concern include operating and maintenance cost as well as training for operator and maintenance personnel. Advantages include improved response time, man-hour savings, flexibility, quality control, consistency, improved accuracy of the final product, and higher volume capability. Experimental and operational work has proven that Interactive Mapping Systems can produce maps, charts, and related products to required specifications and accuracies.



Interactive mapping is developing at a time when digital data and related products are in great demand and economy and efficiency are becoming increasingly important.

SYSTEMS EXAMPLES

The Lineal Input System (LIS) is a portion of the Interactive Mapping System at DMA where it is used for creating and maintaining digital representation of lineal features in an automated on-line computerized system. LIS equipment includes off-the-shelf general-purpose minicomputer, graphic display devices, peripheral disk pack and tape drives, printers, plotters, and lineal digitizers complemented by both vendor-supplied and customer-developed software.

The major LIS components and their functions include: a cartographic table containing a cursor/carriage/gantry arrangement which can perform digitizing, plotting or interactive editing; a batch processing system that provides software for an extensive set of cartographic processing functions; and a Cartographic Data Base System feature classification.

The latter produces a "data cell," which is a collection of geographically related lineal features. Feature descriptions and locational precision are detailed enough to permit exploitation for various conventional mapping and advanced aerospace products. The output file also identifies source material sufficiently to establish its own accuracy and completeness in support of data base maintenance and data exploitation.

The LIS is a rapid means of updating data bases. Communication between the cartographer/operator and the system takes place using functional words rather than codes. The major benefit of the LIS is error-free digital representations of mapping source material.

The DMA digital mapping system employs the UNIVAC 1108, a large-scale computer. Automated cartographic and photogrammetric equipment is coupled with specially designed computer programs and integrated with hardware into a production system known as the Semi-Automated Cartographic System

(SACARTS). Phase 1 has been implemented and presently produces color-separated material.

SACARTS includes graphic digitizer compilation units, high-speed verification plotters, fast ultra-precise linework, symbol, alphanumeric photoplotting, Control Graticule and Grid (CONGRD) software, and a Symbols, Names, and Placement System (SNAPS). The operator at the digitization station records point, line, and text information for processing through the Graphic Improvement Software Transformation System (GISTS). Once the digitized data is drafted by flatbed plotters for editing and refinement, the refined data is then stored on tape or produced by final plotters in the form of scribecoat, photographic film or paper.

Interactive Mapping Systems and digitization are being implemented in many city planning offices, utility companies, construction companies and other types of production facilities, resulting in significant cost and manpower savings as well as more efficient revision, storage and reproduction of products.

Rapid growth in the field has resulted in numerous private enterprises that provide assistance in interactive mapping, operating much like computer services companies. Services are available for digitizing, data reduction, data base generation, software development, analysis, computer processing and computer graphics. Such service organizations have engaged in meteorology, geology, hydrology, and biology, as well as mapping. Some of these companies advertise mapping services at approximately half the cost of producing the same maps conventionally and in half the time required for manual preparation.

SUMMARY

The development and refinement of Interactive Mapping Systems will continue to have a great impact on manpower, cost, and organizational structure in cartographic agencies, and will provide a level of response and a variety of products never before possible. Interactive mapping is materializing at a time when military and civilian demands for digital data and related products are rapidly increasing, as may be seen in on-board navigation systems for modern aircraft, missile systems, target locating, census records, utilities, etc.

Since Interactive Mapping Systems are automated, but not automatic, they call for a high degree of man/machine interaction. Cartographers provide the human intelligence and cartographic input, while the system provides the speed, precision and computational muscle to accomplish the mapping mission within an acceptable response time.

CW2 Herbert Kressler, Jr., is currently assigned as Course Manager of the Basic Cartography Course in the Department of Cartography and Applied Graphics at the Defense Mapping School, Fort Belvoir, VA. He is a native of Quakertown, Pennsylvania.

Commander's Update

COL Philip R. Hoge
2nd Engineer Group, 8th Army

COL Jerome B. Hilmes
7th Engineer Brigade, USAREUR

COL James W. Vanlobensels
18th Engineer Brigade, USAREUR

COL John C. Levanger
20th Engineer Brigade, Fort Bragg

COL Robert E. Ayers
36th Engineer Group, Fort Benning

COL Thomas M. McClelland
130th Engineer Brigade, USAREUR

COL Joseph L. Spruill
937th Engineer Group, Fort Riley

COL George H. Hilt
USA Engineer Center Brigade
Fort Belvoir

COL Kerwood W. Barrand
USA Engineer Training Brigade
Fort Belvoir

COL James K. Highfill
2nd Training Brigade (OSUT)
Fort Leonard Wood

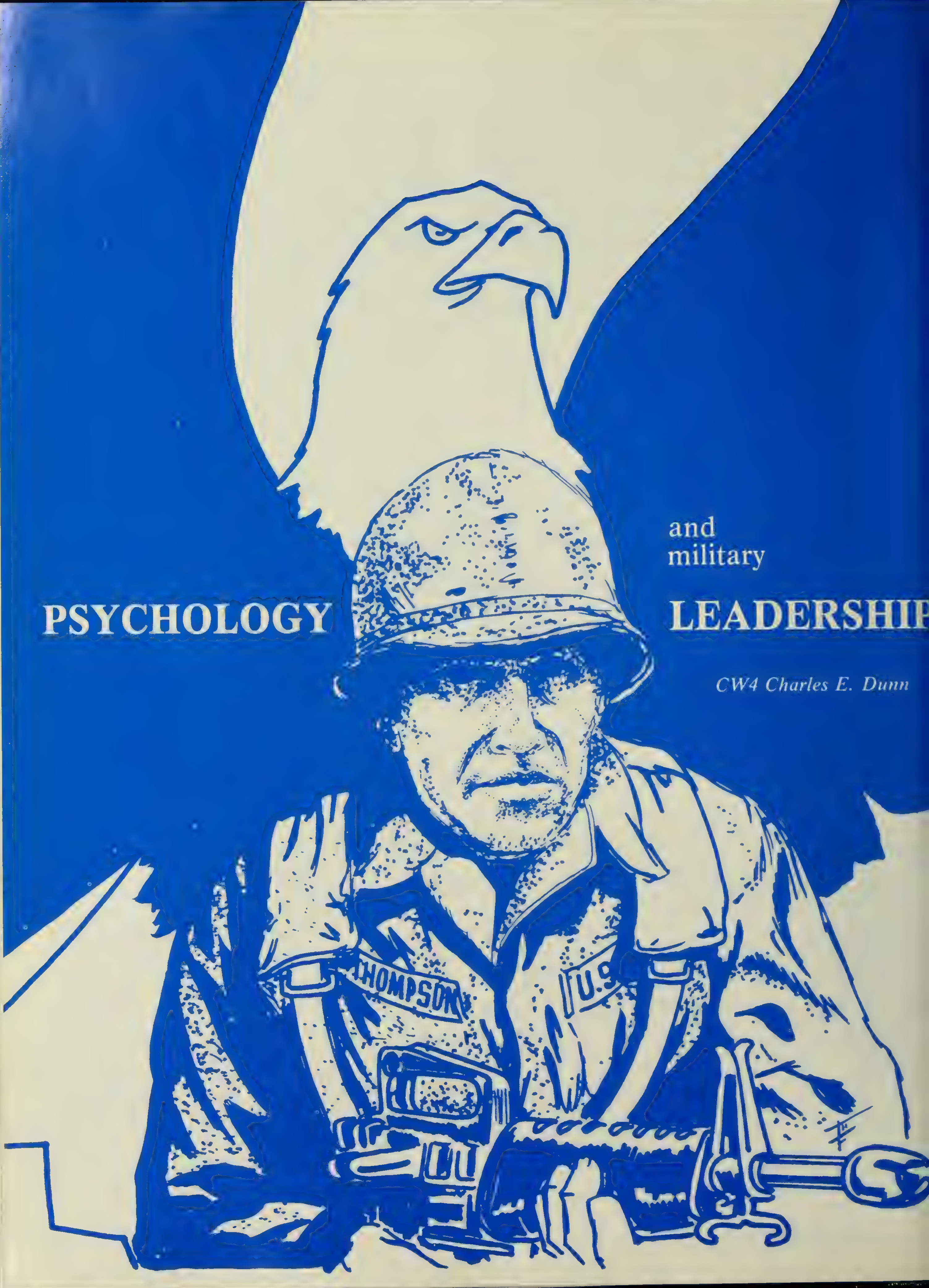
COL Tenho R. Hukkala
4th AIT Brigade (Engineer)
Fort Leonard Wood

CE Directory

The 1979 Corps of Engineers Officer and Warrant Officer Directory is available for purchase from the Post Exchange Book Store, Building 269, Fort Belvoir VA 22060. The cost of the 1979 Directory is $1.50 per copy. Due to personnel constraints, the directory is no longer available by mail order through the USAES Periodical Publications Fund.

PSYCHOLOGY and military LEADERSHIP

CW4 Charles E. Dunn



ON ANY given day from one to many very proud men and women are handed a document that appoints them as officers and non-commissioned officers in the United States Army.

What problems must newly appointed commissioned, warrant and non-commissioned officers surmount to become good leaders? How can they gain the willing obedience of their subordinates? How, if at all, does psychology affect their ability to lead? The answer to these and other questions about military leadership will be found in this article.

Before leadership can be discussed it must be defined. According to Merriam-Webster, the verb *lead* means "to guide on a way" and "to direct the operations, activity or performance of." A much more meaningful and useful definition which agrees with Webster is offered by Norman Copeland: "Leadership is the art of dealing with human nature, influencing a body of people, by persuasion or example, to follow a line of action."

Keeping in mind the definition of leadership, a definition of military leadership must be determined. The best definition I have found comes from the Department of Defense Command and Small Unit Leadership pamphlet: "Military Leadership is the art of influencing and directing men in such a way as to obtain their willing obedience, confidence, respect and loyal cooperation in order to accomplish the mission."

THE SAME pamphlet offers further amplification of the definition: "The ability to handle men, the heart of leadership involves understanding, predicting, and controlling men's behavior." Now consider objectives of psychology as set down by Ruch: "to understand, predict, and control the conditions and situations that man meets in his environment and within himself." Thus it is easy to understand that the practice of psychology and leadership parallel each other and have the same goal. In fact, leaders are continually drawing from the work of psychologists and psychologists use leadership situations and experience to aid their work.

Perhaps social psychology offers the greatest promise for future applications of psychology to leadership. Among military officers there are few problems as important as the selection and training of leaders, the organization and managing of teams, the predicting and influencing of attitudes, and the group process of evaluating evidence to decide a course of action. Although military leaders are selected today through various tests, we are looking for better and more scientific ways of predicting the leadership potential of those selected. It is very difficult to break down a leader's functions into unitary and measurable factors.

Apparently, general leadership traits do not exist, or else are not classified in any familiar psychological or common-sense terms. Furthermore, it is apparent that traits which distinguish leaders from followers vary from situation to situation. It is not, however, a completely block situation. Leaders do not have to be chosen in the dark. Leadership traits such as age, dominance and emotional control are not necessarily required for a particular leadership role. Each particular type of leadership does require certain traits. There are also a few universal leadership traits, including verbal fluency and intelligence.

DESPITE the fact that psychologists are unable to scientifically pinpoint the traits of a good leader, an entire book could be written on quotations by famous military leaders about the qualities a good leader should possess. In his book, "On War," Clousewite indicates that ambition makes a great leader. He says all great leaders possess ambition, the desire to outperform others, to raise oneself above the rest.

In choosing people as future leaders, the most satisfactory, though not foolproof, method would seem to be the following: (a) determine, as closely as possible, what traits are desirable for the type leadership desired; (b) determine each applicant's military leadership traits and universal leadership traits; (c) determine the moral and intelligence level of each applicant through tests and evaluations by superiors, peers and subordinates.

There are three basic types of leadership. The first type and the one most often found in the military service is autocratic leadership, whereby the leader seeks obedience from his group. He determines policy and considers decision-making a one-man operation. However, even in the military, this isn't the only type leadership that is or should be used.

DEMOCRATIC leadership is where the leader irons out ideas and suggestions from the group by discussion and consultation. Group members are encouraged to take part in setting policy, while the leader's role is largely one of moderator.

Laissez-Faire leadership is demonstrated by the leader who is more or less an information booth. He plays down his role in the group's activity. He is on hand to provide materials and information. He exercises a minimum of control.

It might appear to the casual observer that autocratic leadership is the only type of leadership used in the military. To the psychologist it may appear that democratic leadership is the best. But the fact is, autocratic leadership in certain situations will be more effective and successful than the democratic or laissez-faire approach. Democratic leadership, under the right conditions, renders better results than any other method.

Let's look at how each method might be used by a military leader. A new platoon leader takes over a platoon and learns that his platoon has to take a technical proficiency test in two weeks. Since a minimum amount of time is available, he calls his troops together and asks them in what areas they feel a need for intensive training (democratic leadership). He then designates individuals to drive specific vehicles and states that they must be ready to start at 8 a.m. the next day (autocratic leadership). In the midst of training he is called away but before leaving he suggests that the trainees devise a faster way of performing a particular operation (laissez-faire leadership). Thus, in this example, all three types of leadership were used by the same leader on the same group of followers.

IT IS THE skill with which you apply the three basic methods of leadership that determines the level of success as a leader. Each leader will usually tend to favor one type of leadership over the other two.

Psychologists generally agree that every aspect of our behavior is a manifestation of our personality. Depending on our personalities, we prefer certain leadership methods more than others. In the long run we do better with whichever method feels more natural. Every leader must, nevertheless, use each of the three basic approaches to some extent.

But the problem of when to use which type of leadership remains. The solution depends on three factors—the characteristics of the group, the leader, and the situation. Most often the proper approach requires a compromise of all three factors. The effect of the leader's personality on his choice of leadership method has already been discussed, so I will now address the effect of the situation. In time of crisis people expect, even demand, strong leadership. When the pressure is relieved the tendency flows in the opposite direction. Age, sex, and background experience must also be considered. A subordinate's familiarity with his job or assignment favors democratic or laissez-faire leadership over autocratic leadership. It is also worth noting that people tend to prefer the same kind of leadership they would themselves provide.

Leadership, unfortunately, is not simply a matter of evaluating the three types of leadership and deciding which to use. Discipline alone converts a crowd into an army. Therefore, in order to convert a group into a team, discipline must be one of the leader's primary considerations. But what is discipline?

DISCIPLINE is the foundation of morale. It is the systematic training, exercise, development and control of the physical faculties. It is the system of instruction and submission to established authority, self-control and orderly behavior.

The best type of discipline evolves from the following conditions: (1) the leader knows the individuals who make up his group. he knows their mental make-up, their complaints and worries, their family circumstances, their history and future ambitions. He is genuinely interested. An outstanding leader will go to more trouble to understand and handle a single individual than an ordinary person will take to understand and handle an Army. (2) The individuals who make up the group know their leader. (3) The leader identifies himself with the group in every possible way. The successful leader must have empathy with the group, be in tune with it, and yet in advance of it. He must be a person of character and personality. (4) The whole group is a team inspired by the enthusiasm of the leader. (5) The team has a high esprit-de-corps. (6) The team is well instructed, keen and efficient. If a leader can establish these conditions, he will have a group that will be able to discipline itself.

Three important psychological needs that the leader must constantly be aware of are recognition, security and social approval. Recognition includes medals, letters of appreciation, etc. Another effective method of demonstrating recognition is to call a person by his/her name. A person's name is the most important thing in the English language. Calling a person by name gives him/her an identity. It singles that person out as an individual. It gives the person a sense of importance, a feeling of confidence and respect. Recognition is also shown through encouragement. It is well to remember that a good way to develop the best in anyone is by encouragement. There never has been an outstanding leader who did not keep this fact constantly in mind. Human nature craves recognition and appreciation.

A LEADER can instill a sense of security in his followers by developing their confidence in him. There is a good deal of evidence that military leaders who take care of their troops are the ones most enthusiastically followed.

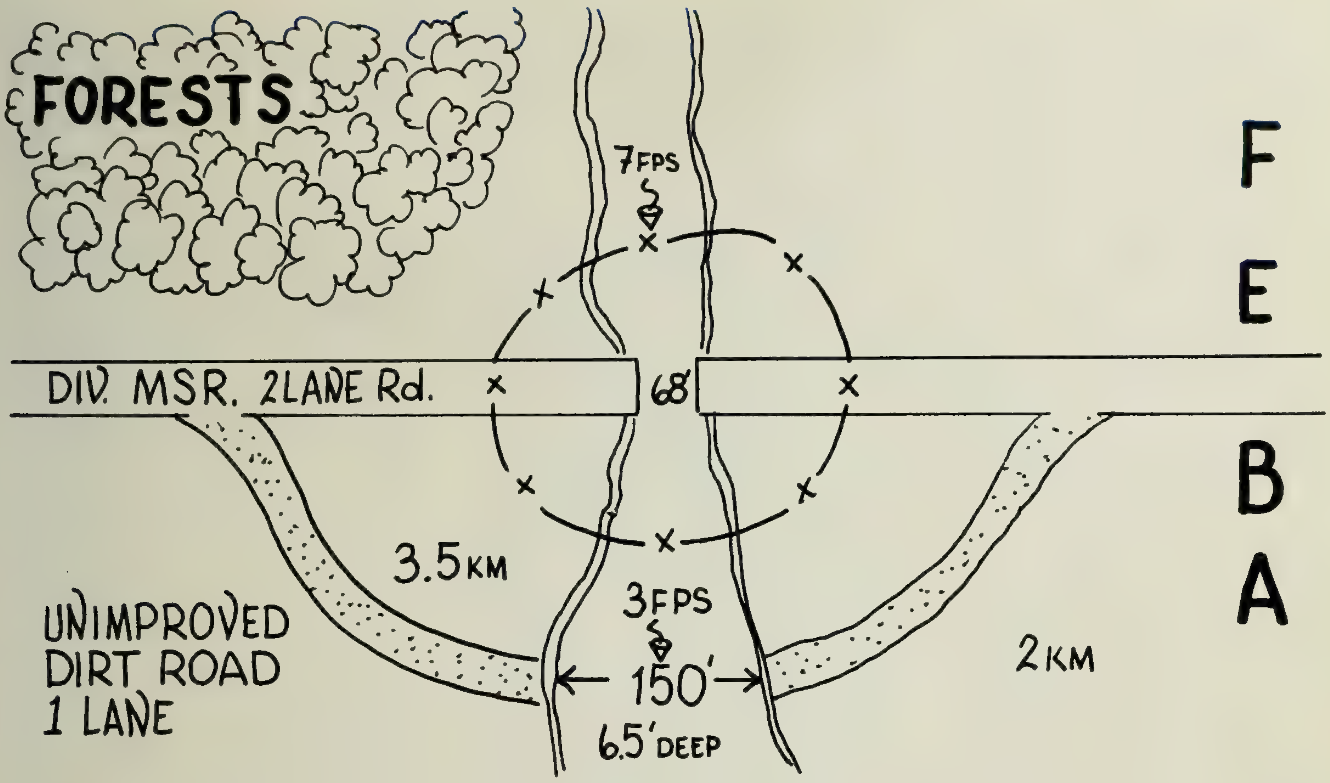
The power of the need for social approval is demonstrated by the following incident from the book, "Men Against Fire," by Marshall. A young company runner, hit by a shell at Corenton, collapsed in the arms of his commander and, with his life swiftly ebbing, said, "Captain, the company has always called me a --- up. Tell me that I wasn't one this time." The Captain replied, "No son, you weren't," and the boy died with a smile on his face. It is extremely strong force which enables a person to do what has to be done when the common good requires the repression of personal ambition.

Through the understanding and application of recognition, security and social approval, the leader is able to succeed. One of his chief duties is to develop and harness the collective mind of the group to work with maximum effort and efficiency.

Just the high points of leadership as it is connected with psychology have been discussed, but it should be clear that good leadership requires diligent study and much hard work. For leadership is a way of life in the military.

CW4 Charles E. Dunn is currently assigned as Operations Officer, Department of Mechanical and Technical Equipment, Directorate of Training, USAES. He holds a Bachelors Degree in Management from the University of Nebraska at Omaha and will soon complete his Masters program in Human Resource Management at Pepperdine University.

Tactical Problem



SITUATION

Enemy sappers have destroyed a bridge along the divisional Main Supply Route (MSR) using the water plume technique of demolition. The enemy has also emplaced an artillery delivered interdiction mine field 200 meters in diameter around the destroyed bridge. The bridge abutments sustained only negligible damage.

Your S-2 section has provided you with the following intelligence report: fair weather is expected to prevail for the next 10 days; there have been no recent heavy rains; the area of operations is in a glacial outwash plain, which contains many kames and eskers; the only vegetation in the area of operations is light to medium coniferous forests; enemy artillery has a range of 30 kilometers and has nuclear and chemical capabilities.

Your own available forces and equipment includes: two combat engineer platoons less than 45 minutes away; one earth moving engineer platoon less than 75 minutes away; nine interior sections and three ramp sections of ribbon bridge for the next 48 hours; four bridge erecton boats and an overhead bridle anchorage system less than 90 minutes away; class 60 equipment three hours away; 100 feet of DD Bailey bridge two hours and 45 minutes away.

PROBLEM

You are the S-3 for the engineer battalion responsible for maintaining the MSR. Your mission is to re-establish the divisional MSR within three hours. How do you accomplish your mission and what factors must you take into account?

See THE SCHOOL SOLUTION, page 40.

Correction

We apologize to Sergeant First Class Larry A. Sirmans, Senior Drill Sergeant for Charlie Company, 1st Battalion, 2nd Brigade, Fort Leonard Wood, MO. SFC Sirmans was incorrectly identified as SFC Simmons in the article entitled "A Bridge Too Long" in the Fall 1978 edition of THE ENGINEER.

—Editor

Officer Career Info

COLONELS

The 0-6 level command boards are scheduled as follows:

Combat Arms	6-23 FEB 79
Combat Support Arms	12-23 FEB 79
Combat Service Support Arms	6-23 FEB 79

Assignment selections normally start shortly after the command board closing date. Preferences for both troop assignments and District assignments should be provided for MILPERCEN use by early February.

LIEUTENANT COLONELS

Congratulations to those officers selected for promotion by the recent Lieutenant Colonel (AUS) board. The competition was tough and each of you can take pride in your selection. You will face new challenges and demands as O-5s and MILPERCEN welcomes the opportunity to work with you in meeting your career plans and needs.

Most assignments that LTCs desire require CGSC level schooling. If you have not already attended, invest some time in your future by taking the non-resident course. It will open up opportunities for you and will be time well spent.

MAJORS

- A reminder . . . in today's competitive promotion environment it's important to keep your official photo and physical current. The height-weight ratio (AR 600-9) is considered by the boards.
- Yes, we still use preference statements! You're urged to update yours as changes occur.
- Priority fill assignments for Majors still include Army Readiness Regions. These are considered Specialty 21 (ENGINEER) developmental positions and, based on all indications, are very competitive from the standpoint of manner of performance ratings.
- For Majors entering the promotion zone to LTC, all indicators say that CGSC attendance (be it resident or non-resident) is critical. If you've completed the school, insure that your file reflects it. If you haven't, it's time to get going on the non-resident course.

CAPTAINS AND LIEUTENANTS

Many queries are received at Engineer Branch regarding eligibility criteria and procedures for applying for civil school at either the graduate or undergraduate level. A summary of the programs and eligibility criteria follows.

Undergraduate schooling for eligible officers is provided by the Degree Completion Program in a discipline of functional value to the Army. Eligibility criteria, in general, includes high manner of performance evaluation, good promotional potential, not less than three or greater than 14 years time in service (TIS), completion of EOAC, and successful company command. As a rule, officers should not apply for this program unless they are within one year of completing degree requirements. Application for this program is made to Engineer Branch in accordance with Chapter 8, AR 621-1. No specific utilization tour is required for undergraduate schooling, but a service obligation of three years for each year or fraction of a year of schooling (up to a maximum of four years) is incurred. Cost of tuition, fees, and books for this program are paid by the officer, though VA benefits may help offset these expenses.

Graduate schooling is provided under several programs although all have some common elements. These include the requirement for study in a validated Army Education Requirement Board (AERB) discipline, a service obligation identical to that described for the undergraduate program above, and the requirement for immediate utilization in a validated AERB position following the period of schooling. All programs are highly competitive. Eligibility criteria includes high overall manner of performance evaluation, completion of EOAC and a successful command tour, high promotion potential, and not less than five years time in service. Overseas equity is also a consideration. The principal programs follow:

. . . The fully funded program authorizes up to 18 months study. Department of the Army pays tuition and an allowance for books and fees. This program is dependent upon quotas authorized for study in specific shortage disciplines. Application to Engineer Branch is made on DA Form 1618-R in accordance with Chapter 4, AR 621-1.

. . . The Degree Completion Program (Graduate level) authorizes up to 18 months of graduate study in a shortage discipline. Application, by letter, is made to Engineer Branch in accordance with para 8-5, AR 621-1. All expenses are paid by the participant.

. . . The Advanced Degree Program for ROTC Instructors (AD PRID) program also authorizes up to 18 months of full time study in a shortage discipline followed by utilization as an ROTC instructor. As for the Degree Completion Program, costs of study are paid by the participant with, as appropriate, VA assistance. Application is made by letter in accordance with AR 621-101. Since this program requires nomination to and acceptance by a school for ROTC duty as well as acceptance for study, applications take longer to process than for the other programs.

. . . Permissive TDY may be authorized for degree completion that may be accomplished within 20 weeks of full time study. Application is made in accordance with Para 8-4c, AR 621-1. With the exception of possible VA benefits, no expenses are paid by the government for this program.

. . . The United States Military Academy (USMA) program is essentially the fully-funded program described above, with certain exceptions: (1) the program is nominative; (2) study may be authorized for up to two years; and (3) study must be accomplished in a discipline and at a school acceptable to USMA. This program is extremely competitive and, in addition to the general criteria specified for graduate study above, Engineer Branch requires completion of a minimum of two tours in an officer's primary specialty before nomination for this program.

ENGINEER PERSONNEL MANAGEMENT CONTACTS IN OPMD

—Colonels Division (DAPC-OPC-AE): Lt. Col. L.E. Lufkin x7871.

—Lieutenant Colonels Division (DAPC-OPL-AS): Lt. Col. Tom Fisher x0423.

—Majors Division (DAPC-OPM-A): Major Wayne Roth x8199.

—Combat Support Arms Division, Engineer Branch (Company Grade) (DAPC-OPF-E): Branch Chief, Lt. Col. H.A. Froehle x0650; Professional Development, Major W.T. Gregory x0650; Captains Assignments, Major Mike Foster x0651; Lieutenants Assignments, Captain Bob Melchior x7434.

—Warrant Officers Division (DAPC-OPW-AU): CW3 Aleck Fletcher x7837.

Autovon prefix is 221, commerical prefix is (202) 325. Mailing address is: Commander, U.S. Army Military Personnel Center, ATTN: (Appropriate office symbol), 200 Stovall Street, Alexandria, VA 22332.

PROJECTED ASSIGNMENTS FOR OAC STUDENTS

Effective 1 June 1979, officers selected to attend the Engineer Officer Advanced Course (EOAC) will be advised on projected follow-on assignments. The new program is designed to eliminate uncertainty regarding the future and to allow student officers to tailor their EOAC elective program to the requirements of their follow-on assignment.

Requests for orders (RFOs) assigning officers to EOAC will contain special instructions requesting an up-to-date preference statement be submitted to OPMD within 30 days of receipt of the RFO. The statement should include recent and current duty assignments, professional desires, medical/special schooling needs for dependents, planned leave address, and telephone numbers.

Upon receipt of preference statements, OPMD will consider the officer's needs and desires as projected assignments are matched. Most officers selected for EOAC will be advised of their projected assignments prior to departing current duty stations enroute to EOAC. However, some assignments may not be completely confirmed until after reporting for EOAC. Examples include officers being considered for advanced civil schooling or certain nominative assignments such as ROTC assignments, which require concurrence of the gaining organization.

Projected assignments will normally be honored, but changes could occur when events alter the major considerations of professional development and personal needs. When a change is considered necessary, it will be coordinated with the individual officer concerned.

Orders for the follow-on assignment will be issued following OPMD branch visits to the EOAC. The purpose of the visits will be to formally interview each officer, answer questions regarding career development/progression, and to resolve all follow-on assignments.

EDUCATION BENEFITS

Some officers who entered on active duty prior to January 2, 1978 may still be eligible for G.I. Bill educational benefits, according to education officials at The Adjutant General Center (TAGCEN).

The Department of Defense together with the Veterans Administration have decided that persons who entered the Reserve Officers Training Corps program before January 1, 1977 and who were commissioned and served on active duty before January 2, 1978 are eligible for educational benefits under the G.I. Bill.

All service members who came on active duty after December 31, 1976 remain eligible to participate in the Veterans Educational Assistance Program (VEAP), which superceded the old G.I. Bill. More information may be obtained form Veterans Service Centers and local installation education services centers.

Enlisted Career Info

SQT GUIDANCE

The following guidance from Change 59, AR 600-200 clarifies requirements for eligibility and exemption from Skill Qualification Testing (SQT):

Soldiers must submit to SQT if they have completed a minimum of 12 months active Federal Service and are properly classified in a primary MOS identified in the SQT announcement circular. Soldiers in pay grade E-1 through E-4 must have held their PMOS, regardless of time in grade, for a minimum of 90 days immediately prior to testing. Soldiers in pay grade E-5 and above must have held their PMOS and pay grade for a minimum of 90 days immediately prior to the test date.

Exemption from SQT is granted for the following reasons only: (a) participation in a course of instruction which, upon successful completion, results in advancement to commissioned or warrant officer status; (b) attendance at a civilian college or university on a full-time basis under the provisions of AR 621-1 or AR 621-7; (c) attendance at an MOS producing course or functional school; (d) voluntary retirement within six months of the scheduled test date; (e) attendance at the resident NCOES course; (f) confinement to a civil or military detention facility; (g) separation from active duty within 90 days of the scheduled test date (applicable only to first-term soldiers who have previously verified their current PMOS and grade through SQT); and (h) special exemptions granted by the Commander of MILPERCEN.

Soldiers may request SQT while in an exempt status or within the 90-day period after termination of the exempt status. Soldiers preparing to ETS during the test period are not exempt except under the conditions listed above, and are still required to undergo SQT if it is scheduled prior to their ETS date.

SOLDIERS MANUALS

A new issue and control policy on Soldiers Manuals has been instituted recently. In the past, Soldiers Manuals were distributed directly to each individual soldier to retain permanently. The system, however, proved to be ineffective because many soldiers were reporting to new duty stations without their manuals, thus necessitating a new issue.

Henceforth, SMs will be issued to units. The quantity issued to each unit will correspond to unit strength for each MOS. Control of the manuals will be the responsibility of unit commanders.

The new control procedure should eliminate the requirement to replace manuals lost during PCS moves.

ROTC SCHOLARSHIPS

The application period for the Two-Year Army ROTC Scholarship Program for active duty enlisted personnel opened January 15. Winners for the 1979-80 school year will be announced in June.

These scholarships are designed to provide Army enlisted men and women an opportunity to obtain both a college degree and commission as an Army officer through participation in the ROTC program.

The award will pay full tuition, books and miscellaneous educational fees, plus provide a living allowance of up to $1,000 a year for each year the scholarship is in effect. In addition, winners will be paid for attending the Advanced Camp, normally held during the summer between the junior and senior years of college. Besides the scholarship benefits, winners may also take advantage of Veterans Administration benefits to which they would normally be entitled.

Competition for scholarships is limited to enlisted personnel who: have served at least one year on active duty; will be under 25 years of age on June 30 of the year they are eligible for commissioning; and have already received credit for at least two years but not more than two and one-half years of college. Also, to be considered by the final selection committee, applicants must have been accepted by a college for next fall's enrollment, must have earned a GT score of 115 or higher, and must be United States citizens.

Winners may attend any of the four-year colleges and universities hosting Army ROTC or one of the more than 500 non-host colleges which has a cross-enrollment agreement with a nearby host school.

Scholarship winners will receive an early discharge so they can arrive on campus in time to enroll in the 1979-80 fall term. Winners will also be required to enlist in the US Army Reserve prior to enrollment in the Army ROTC Advanced Course.

Additional details of this program are contained in AR 145-1.

Applications must be requested by April 15, although applicants have until May 1 to complete their applications. For further information and applications, write Army ROTC Scholarships, Ft. Monroe, VA 23651.

OCS

The first step for soldiers interested in applying for OCS is to complete a DA Form 61, Application for Appointment. Unit commanders are then responsible for counseling applicants, administering an Army Physical Fitness Test and rating each applicant.

Interested personnel who haven't already submitted their applications to MILPERCEN for OCS Class 3-79 beginning 22 April have until 2 March to get their applications in for Class 4-79 beginning 3 June.

OCS is a 14-week course designed to produce professional comissioned officers for various Army branches. Basic eligibility requirements include the following:

- No more than 10 years of active service at date of OCS completion.
- Two or more years of college credit (minimum of 60 semester hours).
- At least 19½ years and not more than 29 years of age upon enrollment.
- Test scores of 110 GT, 115 OCT, and composite OCT/OQI of 200 for male and 115 GT for female personnel.

REBIRTH OF AN ENGINEER MOS

Effective 1 September, MOS 12F will be reinstated to the Combat Engineering Career Management Field (CMF 12). The MOS is being re-established for duties associated with the operation of Combat Engineer Vehicles (CEV), Armored Vehicle Launched Bridges (AVLB), and Armored Personnel Carriers (APC) organic to engineer units. The MOS encompasses approximately 1,320 positions with a skill level distribution of 864 at skill level one, 245 at two, 156 at three and 55 at four.

The Engineer Tracked Vehicle Crewman will serve in various duty positions and units during his Army career. Table 1 summarizes these positions for each skill level. The implementation process will include reclassification of certain incumbents and the start of entry-level training. All positions and personnel currently classified in MOSC 12B1U (APC Driver in engineer units), MOSC 19E10 (CEV and AVLB crewmen only), MOSC 19F10 (CEV and AVLB crewmen only), MOSC 19F20 (CEV and AVLB crewmen only), and MOSC 19E30 (CEV and AVLB crewmen only) will be reclassified in current grade and skill level as MOSC 12F20 and 12F30. Skill level two, three, and four personnel now or formerly associated with CEV and AVLB operations may request reclassification into a 12F MOSC equal to their current skill level. The reclassification actions should be completed by 1 October.

Entry-level training under the One Station Unit Training concept will be conducted at the US Army Training Center Engineer, Fort Leonard Wood, Missouri. The 15-week course is scheduled to begin in September. The first school-trained Engineer Tracked Vehicle Crewman should reach the field in April, 1980.

The Engineer School is currently preparing Soldiers Manuals for the four skill levels of MOS 12F. Coordinating drafts of these manuals will be delivered to the Training Support Center, Training and Doctrine Command (TRADOC), in June. At the same time, The Engineer School will send several draft copies for special coordination to each engineer battalion that has the CEV and AVLB. The final manuals will be delivered to TRADOC by 1 January, 1980 for printing and world-wide distribution. They should reach unit level by early summer, 1980.

EERWA DATA

The Enlisted Efficiency Report Weighted Averages (EERWA), as of 1 October 1978, were as follows:

PAY GRADE	EERWA
E-9	124.34
E-8	123.58
E-7	121.99
E-6	120.10
E-5	116.87
E-4	111.98

SKILL LEVEL	DUTY POSITION	UNIT
1	CEV driver	Engineer
	CEV loader	Engineer
	AVLB operator	Engineer & Armor
	APC driver	Engineer
2	CEV gunner	Engineer
	AVLB commander	Engineer & Armor
3	CEV commander	Engineer
	AVLB section sergeant	Armor
4	Mobility/countermobility section sergeant	Engineer
	Platoon sergeant	Engineer

TABLE 1

NCO Channels

BRIDGE CREWMAN 12C

If you're having problems maintaining training proficiency in MOS 12C or looking for a balanced, well-rounded course of instruction in military bridging, the 12C Bridge Crewman's Primary Technical Course (PTC) at Fort Belvoir might be your answer. Complete course description, prerequisites and class schedules are contained in USAES Pam 350-1, FY-79. The course is five weeks in length and upon successful completion, graduates are qualified in all aspects of tactical bridging.

The PTC uses the latest instructional methods, including practical exercises on actual bridges and classroom models. Instructor-to-student ratio is usually about 1:5, and class size averages about 20. Thus, intensive, individualized instruction is the rule. A complete set of tactical bridging reference material is available to each student and may be retained upon completion of the course. This well-rounded program of instruction includes bridge classification, design and construction procedures on the M2 Bailey, MAB, M4T6 (Class 50 raft and fixed span), LTR, Ribbon and medium girder bridge. Instructor personnel are among the most highly qualified in the Army and are willing to provide individual assistance to each student.

If you are scheduled to attend 12C PTC and need additional information on the course or are interested in learning more about this excellent course, write to: CSM, U.S. Army Engineer School, Fort Belvoir, VA 22060.

APPEARANCE STANDARDS

An increasing number of NCOs are arriving at The Engineer School to attend the Advanced NCO Course in poor physical condition. Upon arrival at Fort Belvoir, each NCO is evaluated to determine if he/she meets the weight and appearance standards. Students who fail to meet the standards are counseled and placed in the weight reduction program (Operation Streamline). And if significant progress isn't made during the 10-week course of instruction, it is reflected in the student's academic efficiency report.

All NCOs should be aware of the possible consequence of substandard appearance prior to their arrival at The Engineer School. It could affect their career development.

TOPO DOCUMENT

There is a new document out entitled "DA Consolidated Topographic Support Program (DACONTP) FY 80-84," which should be interesting reading for TOPO types throughout the Army. It answers a lot of questions about TOPO's future and should be available through unit S-2 sections.

NEW TRAINING BRIGADE

Recent changes have brought about the creation of a new training brigade at the Engineer Center and Fort Belvoir. Effective 1 October 1978 the U.S. Army Engineer Training Brigade was organized. Its two-fold mission is to provide training in three MOSs for which The Engineer School is the proponent but which belong to other Career Management Fields and to provide command and control for all brigade officer and enlisted students at The Engineer School. The new brigade was formed from the Engineer School's Department of Mechanical and Technical Equipment and the 1st and 3d Battalions of The Engineer Center Brigade.

The three MOSs that are taught by the Training Brigade are: 35E—Special Electronic Devices Repairer (CMF 29); 52C—Utilities Equipment Repairer (CMF 53); 52D—Power Generation Equipment Repairer (CMF 63).

Under the current structure the 1st Battalion is responsible for MOS 52D training and the 4th Battalion (newly created under the Brigade organization) is responsible for MOS 35E and 52C training. Each unit provides command and control for students and cadre. The 3d Battalion continues its mission of providing command and control for basic and advanced officer students, NCOs attending the Engineer NCO Advanced Course and AIT students attending the Defense Mapping School.

Current training in the three MOSs is being conducted at Skill Level 1 (35E10, 52C10 and 52D10 Advanced Individual Training). Early next year training will begin in Skill Level 2 (35E20, 52C20 and 52D20, Primary Technical Course).

AIT training in MOS 52D10 has been converted to the self-paced method of instruction. The possible conversion of the remaining two MOSs (35E10 and 52C10) to the self-paced method of instruction is still under study.

The establishment of SL-2 courses in the three MOSs marks a milestone in EPMS development. The prerequisites, course descriptions and class schedules of the SL-2 courses in MOS 35E, 52C and 52D are contained in the USAES Pam 350-1, *FY-79* edition. If your training section doesn't have a copy of the FY-79 edition it can obtain one by sending a completed DA Form 17 or a written request to the U.S. Army Engineer School, ATTN: ATZA-DTR (Individual Training Section), Fort Belvoir, VA 22060.

Reserve Components

NEW LEADERS

Major General LaVern E. Weber was reappointed last August to serve another four years as Chief of the National Guard Bureau, while at the same time, Brigadier General Emmett H. "Mickey" Walker, Jr., assumed his new duties as Director of the Army National Guard.

OVERSEAS TRAINING

Twenty-seven Reserve units had been approved for OCONUS training in 1979 as of 30 October 1978. Four units are slated for training in Korea, with the remaining 23 units scheduled for training in Europe. Two of the latter will participate in REFORGER 79. Two additional USAR units are expected to be selected for overseas training later.

ANNUAL CONFERENCE

Attention was focused on the Gaining Command Program at the 6th Annual Army Readiness Region/Group/Reserve Component Commanders Conference in St. Louis 1-3 December.

The purpose of the Gaining Command Program is to identify specific reserve units and the active Army units they will support in the event of a contingency. The 412th Engineer Command outlined details of the program to the 306 conferees.

The conference, hosted by the U.S. Army Engineer School for the second consecutive year, also surfaced a pressing need to provide Reserve and National Guard units with effective methods for engineer specialty training.

PAY STATUS EXPANDED

High school seniors and graduates who enlist in the Army Reserve within 180 days of their initial active duty for training (IADT), and all others who enlist within 90 days of IADT may now be placed in a paid drill status (pay category P). Those not initially eligible for pay at the time of enlistment may be transferred to pay status when within 180 or 90 days, depending on their educational status. All recruits placed in pay status prior to IADT are expected to attend drills and receive orientation training.

UNAUTHORIZED UNIFORM ITEMS

Some local commanders have apparently misinterpretted their authority to prescribe the uniforms worn in their units, and have approved non-standard items which do not have DA approval. Effective 1 January 1979, only non-standard items approved in ARs 670-5, 672-5-1, or in Common Table of Allowances 50-906 may be worn.

MANAGEMENT OF RETIREES

The Reserve Components Personnel and Administration Center (RCPAC) has begun to identify, classify, establish periodic contact with, and make tentative mobilization assignments for some Army retirees to fill CONUS post, camp and station positions upon national mobilization. The retiree call-up will free other soldiers for demanding troop unit assignments. Individuals being considered for management within the program include retired general officers to age 64, warrant officers to age 62, and others through age 60. RCPAC hopes to contact each selected retiree twice annually to verify addresses, physical status, and civilian occupation. Based upon their military and civilian skills, RCPAC will match the retirees against MTDA positions, and upon mobilization, call them to active duty.

EXPEDITIOUS DISCHARGE PROGRAM

A recent change to AR 135-378 provides a simplified method of eliminating substandard first term enlisted members which will protect the unit and individual from later administrative problems. It applies to non-prior service USAR and ARNG troop program enlisted members who have completed at least six months, but not more than 36 months, of continuous service. Check out the new change for details of the program.

NEW SURVIVOR BENEFIT LAW

A new Survivor Benefit Law extends to Reservists the option of providing survivor benefits even though death may occur before the Reservist attains retirement pay eligibility at age 60. The following options are now available:

—Retirement eligible Reservists may continue to decline making election for or against survivor benefits until reaching age 60. This option remains the same as the arrangement under the previous benefit law.

—The retirement eligible Reservist may elect a survivor annuity payable on the date at which the member would have become 60 years of age, should he or she die prior to age 60.

—The retirement eligible Reservist may elect a survivor annuity payable on the date of death, regardless of whether death occurs before or after age 60.

The intent of the new options is to afford the retirement eligible Reservist the opportunity to provide benefits for survivors, even if the Reservist dies before age 60.

The School Solution

Put in the ribbon bridge initially in order to reopen the MSR within three hours. Upon arrival of the work forces, set up security and breach the mine field. Replace the destroyed bridge with either a Bailey bridge or Class 60 dry span. A log boom with net must be deployed upstream from both bridge sites to prevent further sapper activity.

CONSIDERATIONS AT FLOAT BRIDGE SITE

1. **Approach roads** —In a glacial outwash plain, natural drainage will be good. Use the earth moving platoon to make any urgent repairs to the detour road and to construct turnouts. Once the detour road is usable, the platoon should continue to upgrade, improve, and widen it to eventually allow two-way traffic. Fill material is readily available in any esker or kame.
2. **Bridge** —Considering the speed and ease of emplacing ribbon bridge, along with the width of the stream, the ribbon should be your choice rather than a raft bridge.
3. **Anchorage system** —Use a JD410 backhoe from the earth moving platoon to dig in dead men.

CONSIDERATIONS AT FIXED BRIDGE SITE

1. **Approach roads** —Use a dozer with the driver well protected against shrapnel to clear roads and shoulders. Artillery delivered mines will not be buried and may have anti-handling devices. Any road damage due to mines exploding can be quickly repaired. As time permits, the surrounding forests should be cleared.
2. **Destroyed bridge** —The debris will have to be cleared before the new bridge can be built.
3. **Bailey** —This bridge will require minimal maintenance, but if damaged by artillery or demolition, repair is very difficult, tedious and time consuming.
4. **Class 60 fixed span** —This bridge can be put in faster than the Bailey and is more easily repaired. Intermediate supports can be damaged by debris in the stream and the foundations are subject to be scoured away by the water.

GENERAL CONSIDERATIONS

1. **Camouflage** —Should be used for both sites and all equipment.
2. **Smoke** —Should be used to camouflage movements and for deception purposes at dummy sites.
3. **Security** —Necessary to prevent destruction of the new bridges and to safeguard the equipment and work crews.

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ANNUAL ENGINEER DINNER

The 112th Annual Engineer Dinner is scheduled for May 11 at the Fort Belvoir Engineer Mess. As usual, the Itschner and Sturgis Awards will be presented to the outstanding engineer company and enlisted soldier, respectively, but other details of the annual affair were not available at press time. For more information, write to the Protocol Office, U.S. Army Engineer Center, Fort Belvoir, VA 22060, or call Autovon 354-3332 or commercial 703-664-3332.

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